

6. Findings

Using the criteria laid out in the previous chapter, we analyzed each area of family background. We report the results of each of these analyses with regard to the following issues: response-rate, association with achievement, and reliability (if applicable). The tables that we use for reporting our findings have a standardized structure:

- First, there is one table per study and area of family background and additional tables for each of the derived scales in PIRLS 2006 and PISA 2006. From the total of these 24 resulting tables, two are shown on pages 72–77 as examples. All tables are included in our online appendix to this paper as Tables A.1 to A.24. The appendix can be accessed on <http://www.ierinstitute.org/dissemination-area.html>.
- Second, all countries and benchmark participants are listed. The summary results for the participating countries (except for the benchmarking participants) are listed first. This information is followed by the median, interquartile range, and the 25th and 75th percentiles. The figures for the benchmarking participants are provided at the end of each table.
- The percentages of missing values and the percentages of explained variance (r^2) in a linear regression model are shown for all indicators for the respective area of family background and include scales, if any. The percentages of explained variance are provided for each subject area assessed by the studies of interest (i.e., mathematics, reading, and/or science).
- For the scales, reliability is provided for the full scale, followed by the item-total correlations for the individual items comprising those scales.

In order to enhance the overview of our findings, we have highlighted them according to the categories of the criteria discussed previously (i.e., “low,” “moderate,” and “high;” see Chapter 5.2). Table 6.1 shows the highlighting scheme of the tables in this chapter. High-quality data, regardless of the criteria, receive no highlighting. In the online appendix tables, data of a moderate quality are highlighted in yellow, whereas low-quality data are highlighted in orange.

Table 6.1: Highlighting scheme for the tables in this chapter

Highlight color	Nonresponse (% of missing values)	Association with achievement (% explained variance)	Association with achievement (Pearson correlation coefficient)	Reliability of the scale (Cronbach's alpha)	Item-total correlation (Pearson correlation coefficient)
[None]	Low (<5.0%)	High (>10.0%)	High (>0.3)	High (≥ 0.75)	High (>0.50)
[Light grey]	Moderate (5.0–9.9%)	Moderate (5.0–10.0%)	Moderate (0.20–0.30)	Moderate (0.65–0.74)	Moderate (0.30–0.50)
[Dark grey]	High ($\geq 10.0\%$)	Low (<5.0%)	Low (<0.20)	Low (<0.65)	Low (<0.3)

The results from the correlation analysis are shown in separate tables in the appendix, namely Tables B.1 to B.3.

These appear on: www.ierinstitute.org/dissemination-area.html.

As examples, Table 6.2 shows the results for family's immigration status in PISA 2006 and Table 6.3 provides the results for the Early Home Literacy Activities (EHLA) scale in PIRLS 2006.

6.1 Home Possessions

(Result Tables A.1, A.2, A.3, and A.4)¹

6.1.1 Response Rate

Information on home possessions was provided by almost all students. Throughout the age groups covered by the three studies, the median nonresponse rate was low (< 5%) in all four student populations. The items with the highest median nonresponse rates in PIRLS were the number of books in the home item (3.8%), computer possession in TIMSS Grade 4 (3.3%), and the possession of educational software in PISA (2.9%). In TIMSS Grade 8, there was no item with more than a 2% median nonresponse; here, all items showed similarly (very) low nonresponse.

The dispersion, in terms of the interquartile range (IQR) for most of the items, was low (< 5%). The items that had a moderate dispersion (IQR) across the countries were the number of books in the home in PIRLS (7.1%), the possession of a computer (6.5%), and an internet connection (5.9%) in TIMSS Grade 4.

When we took only the countries participating in both PIRLS and TIMSS Grade 4 into account, we found that Indonesia (20.3%), Kuwait (41.2%), Qatar (21.6%), and South Africa (22.4%) had high nonresponse rates for the number of books in the home in PIRLS, and that Iran (14.3%), Morocco (13.8%), Georgia (10.5%), Norway (9.6%), Germany (9.1%), and New Zealand (5.4%) showed moderate nonresponse rates.



In all these countries, the nonresponse rate was somewhat higher than the rates for the other home-possession items. Also, all of these countries, when compared to the other countries participating in both PIRLS and TIMSS Grade 4, showed a higher nonresponse rate for all home-possession items in general. In TIMSS Grade 4—although now for a different item—a similar array of countries showed higher nonresponse rates compared to the other common countries.

For the item on computer possession, Germany (14.1%), Georgia (10.8%), Morocco (9.7%), Kuwait (8.1%), Qatar (7.8%), Iran (7.3%), and Slovenia (7.3%) all had moderate nonresponse rates. Similar to the finding for PIRLS, the first five countries mentioned showed a higher nonresponse rate for all home-possession items in general when compared to the other countries.

¹ Please note that all remaining tables referred to in this paper can be found in our online appendix on www.ierinstitute.org/dissemination-area.html.

Table 6.2: Example table of results for family's immigration status in PISA 2006

		Student questionnaire									
		Percent missing values					Percent explained variance (R^2)— math achievement				
Country		Mother born in country (ST 11Q02)	Father born in country (ST 11Q03)	Student born in country (ST 11Q01)	Student's age of immigration (ST 11Q04)	IMMIG (Index Immigrant Background)	Mother born in country (ST 11Q02)	Father born in country (ST 11Q03)	Student born in country (ST 11Q01)	Student's age of immigration (ST 11Q04)	IMMIG
		PISA 2006 participants									
Argentina		1.7	2.9	1.8	25.3	2.1	0.1	0.2	0.1	3.7	0.1
Australia		1.4	2.2	1.8	2.2	2.2	0.4	0.2	0.1	0.4	0.2
Austria		0.8	1.2	0.6	3.3	0.8	4.4	5.3	2.5	2.3	5.1
Azerbaijan		5.9	6.1	3.7	11.8	6.4	0.0	0.0	0.2	1.0	0.0
Belgium		1.2	1.8	0.8	23.1	1.5	9.1	9.0	5.8	12.9	9.8
Brazil		0.5	4.3	2.1	0.0	2.1	1.4	0.1	0.2	5.2	1.0
Bulgaria		4.6	4.8	3.0	13.9	4.6	0.1	0.0	0.1	0.5	0.1
Canada		4.9	5.5	4.5	1.9	5.3	0.1	0.1	0.1	0.2	0.1
Chile		3.3	4.6	3.2	0.0	3.7	0.0	0.1	0.0	6.1	0.0
Chinese Taipei		1.4	1.5	1.6	11.2	1.9	0.0	0.0	0.1	2.1	0.1
Colombia		2.2	3.8	2.2	0.0	2.9	0.2	0.4	0.0	0.9	0.2
Croatia		1.3	1.8	0.8	17.1	1.6	0.1	0.1	0.2	0.1	0.4
Czech Republic		0.9	1.5	0.7	6.5	1.1	0.6	0.9	0.3	1.9	0.2
Denmark		0.7	1.1	0.8	2.6	0.8	3.5	4.2	2.0	2.0	4.7
Estonia		2.1	4.4	1.1	12.7	2.3	1.2	1.1	0.1	2.3	0.9
Finland		0.8	1.1	0.4	4.4	0.9	1.0	1.2	1.1	2.8	1.6
France		2.7	3.8	2.9	15.0	3.0	1.8	2.0	1.1	3.4	3.2
Germany		5.8	6.9	4.5	14.4	5.7	6.6	6.5	2.3	1.0	5.4
Greece		1.5	1.6	0.7	4.4	1.5	0.7	0.8	1.1	9.0	1.4
Hong Kong SAR		0.9	1.5	1.0	6.0	1.3	0.7	0.3	2.0	5.2	1.3
Hungary		0.9	1.3	0.7	13.8	0.9	0.0	0.1	0.0	0.4	0.0
Iceland		2.2	2.5	1.6	3.4	2.4	0.7	0.4	0.0	0.7	1.0
Indonesia		1.6	1.7	1.1	22.9	1.9	0.3	0.1	0.1	0.3	0.2
Ireland		2.9	3.4	2.2	8.8	3.1	0.1	0.0	0.0	1.4	0.3
Israel		8.7	9.1	6.5	5.8	8.4	0.1	0.2	0.1	0.0	0.0
Italy		2.5	2.7	1.1	11.4	2.6	0.3	0.5	0.7	2.1	0.7
Japan		0.2	1.2	0.1	2.3	0.1	0.0	0.1	0.0	4.2	0.0
Jordan		3.8	3.8	2.2	5.4	3.9	2.3	2.4	1.1	0.8	1.4
Korea		1.3	1.5	0.4	6.5	1.2	0.0	0.0	0.2	9.0	0.0
Kyrgyzstan		5.6	6.4	4.2	19.2	6.1	1.1	1.8	0.1	0.1	1.0
Latvia		2.7	5.2	1.3	4.8	2.9	0.0	0.0	0.0	3.6	0.0
Liechtenstein		0.9	1.2	0.3	60.0	1.2	2.1	3.0	2.9	2.4	5.6
Lithuania		2.1	3.0	1.3	17.0	2.3	0.0	0.0	0.2	0.3	0.2

Key:  Moderate percentage missing value (5.0–15.0%)
Moderate percentage explained variance (5.0–9.9%)
 High percentage missing value (> 15.0%)
Low percentage explained variance (< 5.0%)


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
Source: Programme for International Assessment 2006.

Student questionnaire											
	Country	Percent explained variance (R^2)— reading achievement					Percent explained variance (R^2)— science achievement				
		Mother born in country (ST11Q02)	Father born in country (ST11Q03)	Student born in country (ST11Q01)	Student's age of immigration (ST11Q04)	IMMIG (Index Immigrant Background)	Mother born in country (ST11Q02)	Father born in country (ST11Q03)	Student born in country (ST11Q01)	Student's age of immigration (ST11Q04)	IMMIG
PISA 2006 participants	Argentina	0.1	0.5	0.5	2.1	0.5	0.0	0.1	0.1	3.2	0.1
	Australia	0.1	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.5	0.0
	Austria	2.4	3.0	1.1	0.8	2.7	6.6	7.9	4.7	7.4	8.7
	Azerbaijan	0.2	0.2	0.3	1.1	0.1	0.0	0.0	0.2	0.8	0.0
	Belgium	7.8	7.3	4.6	7.8	7.7	8.1	7.9	4.3	9.7	8.2
	Brazil	1.4	0.1	0.2	10.0	0.8	1.2	0.1	0.2	5.5	0.7
	Bulgaria	0.0	0.0	0.0	0.2	0.1	0.2	0.0	0.1	0.3	0.1
	Canada	0.1	0.0	0.3	1.1	0.3	0.3	0.3	0.4	0.3	0.6
	Chile	0.1	0.0	0.1	0.4	0.1	0.0	0.1	0.0	3.4	0.1
	Chinese Taipei	0.0	0.0	0.1	0.2	0.3	0.0	0.0	0.1	0.3	0.2
	Colombia	0.2	0.2	0.0	5.1	0.3	0.2	0.3	0.0	0.9	0.3
	Croatia	0.1	0.2	0.1	0.0	0.3	0.2	0.3	0.3	0.4	0.6
	Czech Republic	0.9	0.9	0.9	7.9	0.7	0.7	0.9	0.5	3.2	0.4
	Denmark	2.9	3.8	1.8	3.3	4.2	4.3	5.1	1.9	1.0	5.5
	Estonia	4.4	4.1	0.9	0.1	3.8	2.0	1.8	0.1	2.3	1.6
	Finland	0.4	0.6	0.7	1.7	0.8	0.8	1.2	1.8	8.2	1.9
	France	0.7	1.0	0.6	1.1	1.5	1.6	1.9	1.2	2.1	3.1
	Germany	6.0	5.6	2.0	1.3	4.9	9.1	8.7	3.0	2.0	7.4
	Greece	0.5	0.4	0.7	3.2	0.8	1.0	1.0	1.5	9.9	1.8
	Hong Kong SAR	0.3	0.1	1.8	3.3	0.7	0.4	0.1	1.6	4.9	0.8
	Hungary	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0
	Iceland	0.7	0.6	0.2	4.4	1.4	0.8	0.5	0.0	2.3	1.2
	Indonesia	0.5	0.4	0.3	0.6	0.5	0.4	0.2	0.2	0.5	0.3
	Ireland	0.1	0.0	0.0	1.0	0.1	0.0	0.0	0.0	0.7	0.1
	Israel	0.1	0.1	0.0	0.9	0.0	0.0	0.0	0.1	0.3	0.0
	Italy	0.5	0.9	1.1	4.9	1.2	0.6	1.0	1.1	5.8	1.4
	Japan	0.1	0.1	0.0	1.7	0.1	0.0	0.1	0.0	5.2	0.1
	Jordan	2.4	2.7	1.4	0.5	1.4	2.0	2.5	0.9	0.3	1.2
	Korea	0.1	0.0	0.1	7.6	0.1	0.0	0.0	0.1	21.7	0.0
	Kyrgyzstan	0.2	1.0	0.0	0.0	0.3	0.8	1.6	0.1	0.1	0.6
Latvia	0.1	0.1	0.1	1.4	0.3	0.0	0.0	0.0	4.8	0.0	
Liechtenstein	3.2	4.2	5.5	4.8	8.4	2.4	3.4	2.6	2.6	6.2	
Lithuania	0.1	0.2	0.1	1.3	0.0	0.0	0.1	0.1	0.7	0.0	

Table 6.2: Example table of results for family's immigration status in PISA 2006 (contd.)

		Student questionnaire									
		Percent missing values					Percent explained variance (R^2)— math achievement				
Country		Mother born in country (ST 11Q02)	Father born in country (ST 11Q03)	Student born in country (ST 11Q01)	Student's age of immigration (ST 11Q04)	IMMIG (Index Immigrant Background)	Mother born in country (ST 11Q02)	Father born in country (ST 11Q03)	Student born in country (ST 11Q01)	Student's age of immigration (ST 11Q04)	IMMIG
PISA 2006 participants	Luxembourg	1.4	2.2	1.0	6.6	1.7	5.2	6.6	2.9	0.9	6.3
	Macao-China	1.1	1.5	1.6	3.4	1.9	0.2	0.4	0.3	0.5	0.0
	Mexico	2.6	4.1	3.8	28.4	4.6	2.2	2.3	1.7	0.0	2.6
	Montenegro	2.8	3.1	2.4	7.7	3.2	0.6	0.8	1.0	0.6	0.2
	Netherlands	1.3	1.5	1.4	6.0	1.9	4.5	4.5	0.9	4.9	4.3
	New Zealand	2.1	2.8	1.9	1.7	2.4	0.1	0.0	0.1	0.6	0.0
	Norway	2.3	2.4	2.1	4.7	2.4	0.7	1.4	1.0	0.5	1.9
	Poland	1.7	2.1	0.7	6.2	1.8	0.0	0.0	0.0	5.9	0.0
	Portugal	0.9	1.4	1.1	4.6	1.2	0.6	0.9	0.9	0.0	1.8
	Qatar	8.6	8.6	6.0	9.5	8.7	8.4	9.7	8.8	11.1	11.7
	Romania	0.1	0.3	0.0	49.7	0.1	0.0	0.0	0.0	25.7	0.0
	Russian Federation	1.3	3.5	0.8	7.7	1.4	0.1	0.1	0.0	1.5	0.3
	Serbia	1.7	2.1	1.0	8.7	1.9	0.3	0.6	0.1	0.0	0.2
	Slovak Republic	1.0	1.5	0.8	10.4	1.1	0.2	0.0	0.1	0.2	0.1
	Slovenia	1.1	1.7	0.8	6.2	1.3	1.2	1.4	0.2	1.9	1.4
	Spain	1.2	1.9	1.0	1.1	1.5	1.8	1.7	2.3	1.2	2.7
	Sweden	1.3	1.6	1.6	2.7	1.7	2.2	3.5	2.1	0.7	3.4
	Switzerland	1.2	1.2	0.9	6.7	1.4	7.5	7.7	6.3	0.6	10.3
	Thailand	2.9	3.0	1.5	22.6	3.3	0.0	0.1	0.0	6.1	0.1
	Tunisia	2.0	1.6	1.5	47.7	1.7	0.0	0.3	0.0	15.1	0.5
	Turkey	2.3	2.3	0.8	3.9	2.5	0.3	0.1	0.1	2.9	0.2
	United Kingdom	2.5	3.5	2.8	4.4	3.4	0.2	0.5	0.2	0.1	0.6
	United States	2.4	3.6	2.1	8.5	3.2	1.1	1.1	1.0	0.1	1.4
Uruguay	3.4	4.5	3.6	11.5	4.3	0.1	0.0	0.1	0.4	0.0	
Median	1.7	2.3	1.4	6.6	2.1	0.3	0.4	0.2	1.2	0.4	
Interquartile range	1.5	2.2	1.4	9.4	1.9	1.4	1.7	1.0	3.2	1.7	
25th percentile	1.2	1.5	0.8	4.4	1.4	0.1	0.1	0.1	0.4	0.1	
75th percentile	2.7	3.8	2.2	13.8	3.2	1.4	1.7	1.1	3.6	1.8	

Key:  Moderate percentage missing value (5.0–15.0%)
Moderate percentage explained variance (5.0–9.9%)

 High percentage missing value (> 15.0%)
Low percentage explained variance (< 5.0%)

— Data not available

Source: Programme for International Student Assessment 2006.

Student questionnaire											
Country	Percent explained variance (R^2)— reading achievement					Percent explained variance (R^2)— science achievement					
	Mother born in country (ST11Q02)	Father born in country (ST11Q03)	Student born in country (ST11Q01)	Student's age of immigration (ST11Q04)	IMMIG (Index Immigrant Background)	Mother born in country (ST11Q02)	Father born in country (ST11Q03)	Student born in country (ST11Q01)	Student's age of immigration (ST11Q04)	IMMIG	
Luxembourg	7.6	8.9	3.2	1.8	8.7	8.6	10.0	3.2	1.3	9.4	
Macao-China	0.4	0.9	0.1	0.0	0.2	0.2	0.6	0.8	0.5	0.0	
Mexico	3.2	3.0	2.0	0.1	3.5	2.9	2.7	2.3	0.1	3.6	
Montenegro	0.7	0.9	0.9	0.9	0.3	0.7	0.9	1.4	0.8	0.4	
Netherlands	3.5	3.4	1.2	8.2	3.8	5.2	4.9	1.1	8.0	5.2	
New Zealand	0.1	0.2	0.2	1.6	0.4	0.1	0.2	0.0	1.2	0.2	
Norway	0.6	1.2	1.1	0.9	1.6	0.9	1.5	1.1	1.1	2.0	
Poland	0.0	0.0	0.0	5.7	0.1	0.0	0.0	0.0	3.9	0.0	
Portugal	0.6	0.8	1.0	0.0	1.9	0.8	1.0	1.0	0.0	2.3	
Qatar	8.5	9.2	9.6	10.4	12.1	10.2	11.6	11.0	12.5	14.7	
Romania	0.0	0.1	0.7	30.9	0.0	0.1	0.2	0.2	44.9	0.1	
Russian Federation	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	1.2	0.2	
Serbia	0.3	0.5	0.1	0.2	0.1	0.3	0.4	0.1	0.2	0.1	
Slovak Republic	0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.2	0.1	
Slovenia	0.8	1.0	0.1	1.1	0.9	2.3	2.5	0.4	6.2	2.6	
Spain	1.3	1.3	1.9	0.1	2.2	1.7	1.7	2.5	0.5	3.0	
Sweden	1.6	1.7	1.9	4.9	2.6	2.7	3.8	2.6	1.6	4.4	
Switzerland	5.8	6.3	6.1	0.1	9.3	8.4	8.8	6.8	0.2	11.7	
Thailand	0.0	0.1	0.0	3.6	0.0	0.1	0.3	0.0	16.6	0.3	
Tunisia	0.1	0.5	0.0	13.3	0.7	0.0	0.4	0.0	5.6	0.6	
Turkey	0.0	0.0	0.0	0.2	0.0	0.1	0.1	0.0	0.2	0.1	
United Kingdom	0.1	0.3	0.4	0.1	0.6	0.2	0.5	0.3	0.1	0.8	
United States	–	–	–	–	–	2.2	2.3	1.5	0.0	2.7	
Uruguay	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.2	0.5	0.0	
Median	0.3	0.5	0.3	1.1	0.5	0.4	0.4	0.2	1.2	0.6	
Interquartile range	11.3	1.1	1.0	3.6	1.5	1.9	1.8	1.4	4.6	2.5	
25th percentile	0.1	0.1	0.1	0.2	0.1	0.0	0.1	0.1	0.3	0.1	
75th percentile	1.3	1.2	1.1	3.8	1.7	2.0	1.9	1.5	4.9	2.6	

Table 6.3: Example table of results for the Early Home Literacy Activities (EHLA) scale in PIRLS 2006

Country	Percent missing values	Percent explained variance (r^2)—reading achievement	Full scale reliabilities—Cronbach's alpha	Item-total correlation						
				Reading books (ASBHHAA01)	Telling stories (ASBHHAA02)	Singing songs (ASBHHAA03)	Playing with ABC-tools (ASBHHAA04)	Playing word games (ASBHHAA07)	Reading aloud (ASBHHAA09)	
Austria	5.6	5.0	0.64	0.39	0.41	0.33	0.33	0.44	0.36	
Belgium (Flemish)	3.9	4.1	0.67	0.39	0.38	0.34	0.38	0.49	0.39	
Belgium (French)	11.5	3.7	0.64	0.39	0.41	0.26	0.36	0.46	0.33	
Bulgaria	4.6	3.4	0.79	0.62	0.60	0.36	0.57	0.58	0.52	
Chinese Taipei	6.0	5.7	0.74	0.51	0.53	0.39	0.48	0.48	0.50	
Denmark	6.5	2.4	0.66	0.41	0.40	0.36	0.34	0.49	0.33	
England	53.9	3.9	0.72	0.45	0.42	0.44	0.42	0.53	0.46	
France	9.4	2.8	0.63	0.39	0.39	0.28	0.38	0.43	0.33	
Georgia	8.8	1.6	0.70	0.50	0.35	0.35	0.50	0.49	0.46	
Germany	13.8	1.3	0.61	0.30	0.37	0.32	0.32	0.43	0.34	
Hong Kong SAR	5.4	1.6	0.73	0.53	0.55	0.44	0.39	0.51	0.41	
Hungary	10.7	2.3	0.63	0.38	0.38	0.32	0.39	0.42	0.29	
Iceland	24.3	3.4	0.69	0.38	0.45	0.36	0.42	0.52	0.40	
Indonesia	4.6	2.7	0.73	0.47	0.43	0.41	0.55	0.54	0.43	
Iran, Islamic Republic of	4.5	7.2	0.74	0.51	0.45	0.44	0.47	0.55	0.47	
Israel	38.1	0.1	0.70	0.40	0.47	0.36	0.49	0.48	0.42	
Italy	6.9	1.9	0.60	0.27	0.37	0.27	0.36	0.41	0.35	
Kuwait	28.0	2.3	0.66	0.45	0.41	0.16	0.47	0.49	0.40	
Latvia	6.8	2.2	0.62	0.39	0.40	0.30	0.36	0.40	0.28	
Lithuania	4.3	1.9	0.64	0.39	0.39	0.29	0.41	0.43	0.33	
Luxembourg	8.6	4.6	0.69	0.45	0.44	0.34	0.42	0.50	0.40	
Macedonia	8.4	2.3	0.69	0.43	0.43	0.38	0.46	0.45	0.41	
Moldova	3.5	3.5	0.69	0.51	0.48	0.32	0.47	0.36	0.42	
Morocco	4.8	3.3	0.73	0.53	0.46	0.35	0.51	0.44	0.53	
Netherlands	33.2	1.8	0.66	0.30	0.35	0.34	0.42	0.50	0.44	
New Zealand	35.5	5.5	0.77	0.52	0.53	0.44	0.49	0.58	0.51	
Norway	7.6	1.7	0.65	0.35	0.38	0.32	0.42	0.44	0.37	
Poland	3.6	3.4	0.63	0.37	0.36	0.30	0.42	0.41	0.34	
Qatar	33.0	1.4	0.62	0.34	0.42	0.16	0.41	0.44	0.37	
Romania	3.6	13.6	0.78	0.56	0.59	0.39	0.58	0.58	0.48	
Russian Federation	1.8	4.0	0.68	0.47	0.41	0.33	0.44	0.47	0.36	
Scotland	48.4	5.4	0.72	0.46	0.45	0.40	0.45	0.53	0.48	
Singapore	2.8	4.3	0.79	0.58	0.59	0.49	0.54	0.52	0.56	
Slovak Republic	3.4	2.5	0.61	0.36	0.37	0.24	0.35	0.42	0.34	
Slovenia	6.0	2.6	0.67	0.38	0.43	0.36	0.38	0.48	0.39	
South Africa	16.1	2.2	0.59	0.31	0.27	0.22	0.38	0.39	0.39	
Spain	38.5	3.6	0.64	0.35	0.42	0.36	0.39	0.42	0.28	
Sweden	6.7	1.9	0.69	0.36	0.40	0.38	0.46	0.53	0.39	
Trinidad and Tobago	13.2	6.8	0.73	0.52	0.52	0.39	0.45	0.49	0.45	
United States	–	–	–	–	–	–	–	–	–	

	Country	Percent missing values	Percent explained variance (r^2)—reading achievement	Full scale reliabilities—Cronbach's alpha	Item-total correlation					
					Reading books (ASBHH01)	Telling stories (ASBHH02)	Singing songs (ASBHH03)	Playing with ABC-tools (ASBHH04)	Playing word games (ASBHH07)	Reading aloud (ASBHH09)
PIRLS 2006 benchmark participants	Median	6.9	2.8	0.68	0.40	0.42	0.35	0.42	0.48	0.40
	Interquartile range (IQR)	10.4	2.0	0.09	0.13	0.07	0.07	0.09	0.08	0.11
	25th percentile	4.6	2.0	0.64	0.37	0.39	0.31	0.38	0.43	0.34
	75th percentile	14.9	4.0	0.73	0.50	0.46	0.38	0.47	0.51	0.45
	Canada (Alberta)	20.6	4.1	0.74	0.47	0.48	0.43	0.49	0.53	0.49
	Canada (British Columbia)	23.9	2.7	0.75	0.46	0.48	0.49	0.45	0.52	0.53
	Canada (Nova Scotia)	9.8	3.0	0.73	0.46	0.48	0.40	0.45	0.52	0.51
	Canada (Ontario)	11.4	2.2	0.73	0.47	0.49	0.42	0.46	0.48	0.48
	Canada (Québec)	10.4	2.8	0.68	0.45	0.45	0.34	0.43	0.45	0.38
	Iceland (Grade 5)	33.9	4.9	0.70	0.43	0.45	0.36	0.45	0.51	0.41
Norway (Grade 5)	10.2	2.5	0.64	0.33	0.38	0.26	0.42	0.46	0.37	

- Key: Moderate percentage missing value (5.0–15.0%)
 Moderate percentage explained variance (5.0–9.9%)
 Moderate reliability (0.65–0.74)
 Moderate item-total correlation (0.30–0.50)
- High percentage missing value (> 15.0%)
 Low percentage explained variance (< 5.0%)
 Low reliability (< 0.65)
 Low item-total correlation (< 0.30)

— Data not available

Source: Progress in International Reading Literacy Study 2006.

For the TIMSS Grade 8 and PISA common countries, almost all items showed low nonresponse with respect to the TIMSS Grade 8 data. Only Romania (6.1%) and Tunisia (5.9%) had moderate nonresponse rates for the computer-possession item. For the same set of countries, the PISA data consisted of slightly more nonresponse. Whereas Qatar and Israel had moderate nonresponse rates for all (19) or almost all (17) international home-possession items, Jordan (10) and Tunisia (7) showed moderate nonresponse for at least several items, and Colombia (3) and Romania (1) showed moderate nonresponse for fewer items.

PIRLS also collected (from parents through the home questionnaire) possession information on the number of books as well as children's books in the home. In both cases, the median nonresponse rate was moderate, with 6.3% and 6.1%, respectively. The dispersion (IQR) in both cases was high (11.5% and 11.7%). However, unlike the outcome with respect to the student data, we could find no particular issues with either one of the two variables (which are the only home-possession items included in the PIRLS 2006 home questionnaire). Instead, the country-level results suggested that the high nonresponse rates in several countries were due to unit nonresponse. Moreover, the two items on home possessions showed the least amount of nonresponse in almost all countries, compared to all other items on family background included in the PIRLS home questionnaire.

6.1.2 Association with Achievement

Our investigation into the association of indicators of home possessions with achievement showed that, compared to the other home-possession single items, information on number of books in the home offered the highest amount of explained variance in all three subject domains (reading, mathematics, and science) and in all four student populations. With PISA, we found a strong association between books in the home and student achievement, with a median of the explained variance of 12.6% in science, 12.2% in mathematics, and 11.1% in reading (IQRs between 5.2% and 7.1%). For TIMSS Grade 8, we found a moderate association (8.0% and 8.1%) for both mathematics and science achievement (IQRs of 7.8% and 10.2%). In PIRLS, the median of the variance in reading achievement explained by the number of books in the home (as reported by students) was also moderate, with 8.6% (an IQR of 5.4%). The number of books in the student's home, as reported by the parents, as well as the number of children's books in the home again had a moderate association with students' achievement, with a median of 8.5% and 9.3% of the explained variance (IQRs of 4.7% and 6.7%, respectively), an outcome that is quite similar to the information on books in the home provided by students. Although the medians of the explained variances in mathematics and science achievement in TIMSS Grade 4 were quite similar at 5.5% and 6.3%, respectively (and with IQRs of 7.2% and 6.9%), they were still moderate.

Another variable associated with book owning has been used only in PISA. Possession of classic literature showed a moderate association with achievement, with a median explained variance of 6.1% in mathematics, 6.9% in reading, and 7.1% in science (IQRs of 3.5%, 5.6%, and 4.2%, respectively). The possession of poetry (again used in

PISA only) showed a much weaker relationship, with achievement in all three subject domains. In PISA, an additional item showed moderate associations with student achievement. The number of cars at home accounted for 6.4% of the variance in mathematics, 5.4% in science, and 3.9% in reading achievement (IQRs of 5.1%, 4.6%, and 4.4%). These items are not surveyed in TIMSS and PIRLS.

Students possessing their own books at home was the second-best home-possession single indicator of family background for reading achievement in PIRLS, with a median-explained variance in a simple linear regression model of 4.5% (IQR of 3.1%), which was low according to our classification, and also lower than the variables associated with number of books. No items amongst the TIMSS Grade 4 home possession items were similarly outstanding.

Within the older age group (TIMSS Grade 8 and PISA), possessing a computer had some explanatory power in several countries. However, on average, the median-explained variance was low for both studies and all subject domains. In PISA, the median-explained variances ranged from 3.9% to 4.5% in the three subject domains (IQRs from 4.6% to 7.6%). In TIMSS Grade 8, the median-explained variance in mathematics achievement was 3.1% (IQR of 4.2%), and the median-explained variance in science achievement was 2.2% (IQR of 3.6%).

Another possession item closely related to the possession of a computer at home is the availability of an internet connection. This item was included in TIMSS (both grades) and in PISA. For the older age group, results were similar to those for computer possession. Although availability of internet access at home had some explanatory power in several countries, on average, across all countries, it showed only a low association with achievement. In PISA, the median explained variance was 4.3% for mathematics (IQR of 4.7%), 3.7% for science achievement (IQR of 4.7%), and 3.3% for reading achievement (IQR of 4.0%). In TIMSS Grade 8, it was 2.8% for mathematics and 2.5% for science achievement (IQRs of 4.1% and 3.5%). In TIMSS Grade 4, this variable yielded a median of only 1.9% of the explained variance in mathematics and 1.7% in science achievement (IQRs of 4.1% and 3.5%), suggesting that the internet may not be widely used by students in the younger age group.

For the rest of the variables related to home-possession items, the associations with achievement in either subject domain were low, with medians of explained variance below 5.0%. Because of this result, we consider there is no need to discuss it in detail here.

Our analysis of home-possession items suggests that the possession of books of whatever type was the variable most strongly associated with academic achievement across all four student populations and their combinations of different home-possession items. This kind of possession item is used in many studies as a proxy for cultural capital; some researchers even use it as the only proxy for SES. Regardless of whether using only possession of books at home to represent SES is reasonable or not, the different variables related to availability of books at home all showed a moderate median association with achievement.

The second strongest association between achievement and the possession items used in all studies lay with the variables related to availability of computer access and internet connection at home, although their relationship with academic achievement was much weaker. All other home-possession items, when used as single predictors in the three studies, showed negligible relationships with educational outcomes in terms of achievement.

When we look at country-level results, we can see that the association of possession of books with students' academic achievement was quite diverse across countries. In PIRLS, the association ranged from almost none (0.4%) in Qatar to more than 17.0% in the Slovak Republic, Luxembourg, and Hungary. The TIMSS Grade 4 data showed a similar range, from almost no association, for example, with mathematics achievement in Armenia and Kazakhstan, to 16.6% in Hungary. The TIMSS Grade 4 and PIRLS common countries showed a similar pattern, somewhat independent from the subject area and the study. In Hong Kong SAR, Italy, Kuwait, Morocco, and Qatar, for example, the association between book possession (as reported by students) and achievement was low in both studies and subject areas. In turn, the association was high for another common set of countries (Austria, Chinese Taipei, England, Germany, Hungary, and New Zealand). Similar results emerged from the data for the older age group. In summary, although the association of book possession with achievement was diverse across countries, there were also similar patterns. The same three countries (of the common country sets) had a low association (Indonesia, Jordan, and Qatar), again regardless of the subject area assessed.

6.2 Immigration Status

(Result Tables A.5, A.6, A.7, and A.8)

6.2.1 Response Rate

Immigration status was operationalized in the studies we considered to include three aspects—the immigration status of the parents, the immigration status of the student, and the age of the student when he or she immigrated (the latter information was not collected in PIRLS).

The amount of nonresponse for the variables associated with immigration status was low, in general, for TIMSS and PISA. The age at which students immigrated revealed higher nonresponse than the information on whether any of the three family members (mother, father, student) was born in the country of the test. Whereas in TIMSS Grade 8, the median nonresponse rate for information on students' age of immigration was still low, at 4.5% and an IQR of 4.4%, PISA had a moderate median nonresponse rate of 6.6% (IQR of 9.4%). This result might be due to the different item formats. PISA required students to enter a number; TIMSS used a closed-item format with three categories.

A look at country level in the older age group shows only a few countries in TIMSS Grade 8 and PISA with moderate nonresponse rates for the information on parents' and students' country of birth. In the main, nonresponse for the immigration-age information varied a lot across the PISA countries (from almost none in Brazil, Chile,

and Colombia to 60.0% in Lichtenstein). The variation in TIMSS Grade 8 was much smaller: from almost none in Italy and Korea to 32.7% in Iran, which was a single outlier.

Item format may also be the reason for the moderate nonresponse rates in PIRLS with respect to the information on whether the student's mother and father were born in the country of the test. PIRLS offered students a "don't know" option. When combined with the percentages of omitted responses, the median missing rate was 5.3% (IQR of 6.9%) for the mother's and 6.3% (IQR of 9.1%) for the father's immigration status. Also, the indicator combining both parents' immigration status had a moderate nonresponse rate, with a median of 5.1% (IQR of 6.9%) across countries. However, the information on whether the student was born in the country of the test showed a low nonresponse rate of 2.4% (IQR of 5.7%).

In comparison with the TIMSS Grade 4 data, the data pertaining to the PIRLS countries varied considerably more in relation to nonresponse for information about the country of birth of parents and students. In PIRLS, several countries had a high nonresponse rate for immigrant-status information. Kuwait, for example, showed a percentage of 34.4 for mother's immigration status, whereas in TIMSS Grade 4 only a few countries showed even moderate nonresponse rates (with a maximum of 14.0% for father's immigration status in Germany).

6.2.2 Association with Achievement

Most of the variables related to the immigration status of the students and their parents showed only very weak associations, on average, with all subject domains in terms of explained variance in a linear regression model. With regard to the younger age group, no indicator in PIRLS showed a reasonable association with achievement across all countries (the maximum median-explained variance was 1.0%). The regression model with the combined parents' immigration status was not even significant for the majority of the PIRLS countries in our focus. In TIMSS Grade 4, the combined parents' immigration status also showed only a weak association, with a median of 1.1% (IQR of 1.8%) of the explained variance in mathematics achievement and 1.3% (IQR of 2.7%) in science achievement. Students' immigration status yielded a median of 3.2% (IQR of 5.2%) of the explained variance in mathematics achievement and 2.6% (IQR of 5.8%) in science achievement. In similar vein, only three of the PIRLS countries (Austria, Germany, and Luxembourg) had moderate or strong associations with the separate sets of information on mother's and father's immigration status and student achievement, whereas in TIMSS Grade 4, a good many more countries showed moderate and strong associations. This outcome was especially the case for students' immigration status, which was moderately (13 countries for mathematics and 12 countries for science achievement) or even strongly (two countries for mathematics and three countries for science achievement) associated with students' achievement.

It is interesting, though, that the students' immigration status showed a higher association in the TIMSS Grade 4 than in the TIMSS Grade 8 data. In the older age group, almost no variance was explained by either of the indicators of immigration status (median maximum of 2.1% for TIMSS Grade 8 and 1.2% for PISA). In PISA, not one significant relationship emerged in about half of the countries; and of the TIMSS Grade 8 countries, only a few countries showed such a significant relationship.

A more detailed look at the results at the country level revealed no clear pattern regarding the countries common to TIMSS Grade 8 and PISA. Here, the association between a student's or a family's immigration status was only moderately correlated with the student's achievement. In TIMSS Grade 8, Chinese Taipei (6.4% in mathematics and 6.5% in science achievement) and Indonesia (5.8% in mathematics and 7.1% in science achievement) showed a moderate association between student achievement and whether or not the student was born in the country of the test.

The age at which a student immigrated was moderately associated with the student's achievement in several countries, but the sets of countries differed according to subject area. For mathematics achievement, Japan, Korea, and Romania showed higher associations than did the other countries of interest. For science achievement, this was the case in Israel, Japan, Norway, the Russian Federation, and Thailand. In PISA 2006, Colombia, the Czech Republic, Italy, Japan, Korea, Qatar, Romania, Slovenia, Thailand, and Tunisia all showed a moderate association between some of the immigration variables and students' achievement. When we used data available from the United Nations (2010) to categorize countries according to their immigration policies, we found that the picture regarding the above findings was no clearer.

The set of common countries in the younger age-group studies (PIRLS and TIMSS Grade 4) was quite similar in terms of the immigration status of the parents, with Austria, Germany, and the Netherlands showing moderate associations with achievement. However, when we looked at just the status of the student, both studies yielded very different results. In PIRLS, this indicator seemed to have no explanatory power at all, whereas in TIMSS Grade 4 almost half of the countries in scope showed moderate or even strong associations.

6.3 Language Used at Home

(Result Tables A.9, A.10, A.11, and A.12)

6.3.1 Response Rate

Information that participating students provided on the language used at home had a low level of nonresponse in TIMSS and PISA, with a median of 1.0% in TIMSS Grade 4, 0.9% in TIMSS Grade 8, and 2.7% in PISA (IQRs of 2.7%, 1.1%, and 2.6%). In PIRLS, the median nonresponse level was moderate at 5.8% and an IQR of 7.8%. PIRLS was the only one of the three large-scale studies that asked parents as well as students about the language spoken at home. The median amount of nonresponse was high at 15.6% for language used by the father, and it was moderate (but close to high at 14.7%) for the language used by the mother (IQRs of 15.6% and 16.5%, respectively).

The information on the language of children's books that parents provided was somewhat more complete, but still on a moderate level, with a median of 7.6% of missing data (IQR of 12.3%). More indepth analysis suggested that the large amount of missing data provided by parents compared to data provided by students was due to parents' nonparticipation in the survey. Also, some parents might have had no interest in completing the questionnaire or answering all questions. Another reason could be that only one adult (parent, guardian, or the like) answered the questionnaire, and that he or she was not willing or able to provide the information for a second adult (parent) living with him or her and the child.

Among the common countries of the younger age group, Germany, Kuwait, and Morocco all had a moderate or high nonresponse rate in both TIMSS Grade 4 and PIRLS for student language use. In PIRLS, several more countries showed a moderate or high nonresponse rate, such that no clear pattern emerged. Nevertheless, with response rates in PIRLS ranging from 1.3% in Luxembourg to 33.2% in Kuwait, the amount of missing data—and thus information on the language used at home—seems to have differed to quite a strong degree across countries. Data for the older age group were, in general, more complete. The Grade 8 data for the countries held in common by PISA and TIMSS 2007 showed a nonresponse rate of less than 2.0% in each country. In PISA, only Italy, Israel, Qatar, and Tunisia had moderate nonresponse rates; all other common countries had low nonresponse rates. A few of the PISA countries that did not participate in TIMSS also showed moderate nonresponse rates.

6.3.2 Association with Achievement

Our analysis showed almost no association, in PIRLS, between the language spoken at home, as reported by the students, and students' reading achievement (the median-explained variance was 0.8% and the IQR was 1.3%). We found similar results for the language parents used when talking to the student (median of 0.8% with an IQR of 1.9% for fathers, and 0.9% with an IQR of 1.4% for mothers). The median association between the language of children's books and students' achievement was even lower (0.2% with an IQR of 0.5%). In PIRLS, only three countries showed a moderate (Austria and Luxembourg) or high (Iran) association between language spoken at home, again as reported by students, with reading achievement. The information on the language that parents used at home yielded moderate or high associations in just a few more countries. Four countries showed a moderate (Austria, Bulgaria, and Singapore) or high (Iran) association between mothers' language use and reading achievement. Four countries (Bulgaria, Chinese Taipei, Germany, and Scotland) showed a moderate association between fathers' language use and student achievement, and one (Iran) showed a high association.

Analysis of the TIMSS Grade 4 data revealed a low association across countries for both mathematics achievement (1.5% and an IQR of 2.1%) and science achievement (2.0% and an IQR of 3.5%). Four TIMSS Grade 4 countries (Chinese Taipei, Hong Kong SAR, Iran, and Singapore) showed a moderate association with mathematics achievement, and eight countries showed a moderate (Austria, Chinese Taipei, Germany, Hong

Kong SAR, Iran, and the United States) or a high (Qatar and Singapore) association with science achievement.

Language use at home was operationalized differently in PISA and TIMSS Grade 8. TIMSS asked students to report, using four response categories (“always,” “almost always,” “sometimes,” and “never”), on the frequency with which the language of the test was spoken at home. PISA simply asked if the most frequent language used at home was the language of the test. Regardless of how the question was formulated, the items in both studies did not explain a substantive amount of variance across countries (median maximum of 0.9%), so categorizing the associations as weak. In PISA, we found high or moderate associations only in Liechtenstein (high), Bulgaria, Germany, and Switzerland (moderate) with all three subject areas assessed. In Austria, we found a moderate association with mathematics and science achievement, and in Chinese Taipei the same level of association with reading achievement. In TIMSS Grade 8, four countries (Chinese Taipei, Hong Kong SAR, Iran, and Turkey) showed a moderate association with mathematics and science achievement. Another three countries showed a moderate (Singapore and Thailand) or a high (Qatar) association with science achievement only.

It should be noted that most of the variables associated with the use of different languages are at a nominal level of measurement, a situation that poses limitations on the types of analyses that researchers can perform. More specifically, the only correlation or regression analysis that can be performed with these analyses to test the relationship with achievement is simple linear regression, in which the language of interest is coded as “1” and all the rest of the values are coded as “0.” This type of coding is called “dummy coding,” and we applied it, where relevant, for our analysis purposes.

6.4 Parental Education

(Result Tables A.13, A.14, and A.15)

Earlier in this paper, we delineated the role that parental education, one of the constituents of the family background construct, plays with respect to students’ achievement in school. Our analysis in this paper supported research literature findings that parents’ education is a family characteristic which, in general, has an association with achievement. In the case of our analysis, the association was a moderate one.

The two large-scale studies conducted at the Grade 4 level did not ask the participating students to provide information about their parents’ education. Thus, the TIMSS Grade 4 data contain no information on this variable. In PIRLS, this information was collected via the home questionnaire completed by students’ parents. In PISA (involving the older age group), both students and their parents were asked to provide this information. TIMSS Grade 8 collected these data from students only.

6.4.1 Response Rate

In general, the median amount of nonresponse was again much higher in the data provided by parents (applicable for PISA and PIRLS). The 20.2% median nonresponse for the information on father’s education and 17.6% for mother’s education in PISA (IQRs of 25.5% and 26.8%) along with the 15.9% median nonresponse for father’s education and 16.1% for mother’s education in PIRLS (IQRs of 18.5% and 20.1%) led to us classifying all items at the high nonresponse level. Although the combined measure of the highest education of either parent had less missing data, the nonresponse rate was nevertheless moderate—13.3% in PIRLS (IQR of 18.3%) and 15.0% in PISA (IQR of 24.6%). As the high IQRs already indicate, nonresponse rates differed considerably across countries. For example, whereas the nonresponse rate for all items on parental education was low in the PIRLS data for the Russian Federation (3.6%, 2.9%, and 2.9%), the rates were extremely high in England (57.2%, 57.1%, and 56.2%). A similar diversity was apparent in the PISA home questionnaire data.

The student data nonresponse rates on parental education in PISA were low in absolute terms and also much lower compared to parental nonresponse rates. The median missing rates ranged from 1.1% (IQR of 2.2%) for the combined indicator of parental education to 4.5% (IQR of 4.4%) for father’s education. Accordingly, the differences across countries were much smaller. Only a few countries showed moderate nonresponse rates for information on the mother’s or the father’s education. In all other countries, the rate was low.

The TIMSS Grade 8 student-provided data were exceptional because a “don’t know” option was again offered to students when they were asked to report their parents’ educational attainment. The percentage of students who chose the don’t know option and those who omitted the item added up to a moderate median nonresponse rate for the mother’s education and the father’s education of 8.7% and 10.5% (IQRs of 11.8% and 19.2%), respectively. The combined information about the parents’ highest education level yielded a lower—but still moderate—level of missing data (5.9% with an IQR of 9.4%). Again, the countries’ nonresponse rates differed to quite a marked degree. For example, on the one hand, Malaysia showed very low rates (0.5% for mother’s education, 0.8% for father’s education, and 0.2% for the highest of both), while on the other hand, Sweden had extremely high nonresponse rates (58.5%, 58.2%, and 52.0%, respectively).

6.4.2 Association with Achievement

The variables on parental education showed, in most cases, moderate associations with achievement, a pattern that held across all the studies, age groups, and respondent levels (students and parents). The medians of explained variance in achievement ranged from 5.4% to 11.9% (IQRs of 2.7% to 6.7%). In PIRLS, mother’s education and the parents’ highest education yielded a strong association with reading achievement of 10.7% and 11.9% (IQRs of 5.7% and 6.1%), respectively. The only low association with students’ reading achievement, with 4.6% of the explained variance (IQR of 3.8%), was found for the student-reported information in PISA about mother’s education.

The highest amounts of explained variance for variables related to education, as reported by parents in PISA, were for mathematics achievement, where the explained variance was 6.7% for the mother, 7.1% for the father, and 8.5% for the highest parental education (IQRs of 3.4%, 4.6%, and 3.8%, respectively). The amount of explained variance in achievement in PISA for the education variables (as reported by the students) ranged from 4.6% to 5.4% in reading, 5.8% to 6.7% in science, and 6.1% to 7.1% in mathematics (IQRs of 3.8% to 4.7%, 4.8% to 5.4%, and 4.5% to 5.6%). In PISA, the educational variables, again as reported by the students, showed the strongest association with mathematics achievement. However, the differences with respect to the other cognitive domains were relatively small. When compared to the student-provided data, the information provided by the parents again tended to show slightly stronger associations with achievement. Both the information supplied by students and that supplied by parents on parental education showed somewhat diverse associations across countries, with all three levels of association (weak, moderate, and strong) evident with respect to students' achievement.

The PIRLS data on parental education, collected solely from parents, yielded moderate to strong associations with students' achievement, and were thus the strongest across all three studies and cognitive domains (9.8% for father's education, 10.7% for mother's education, and 11.9% for the highest education of both). Countries differed only to a small extent. In nearly all countries, the associations were moderate or even strong; the only exceptions were the three Canadian provinces, Hong Kong SAR, Italy, and Qatar.

The TIMSS Grade 8 data consisted of variables on parental education obtained from students only. Compared to the association between parental education and student achievement in PISA, the TIMSS Grade 8 association seemed to be stronger. The median-explained variance for mathematics achievement was 6.9% for mother's education, 6.7% for father's education, and 7.5% for the highest parental education (with IQRs of 6.2%, 6.1%, and 5.6%). The relationship with science achievement was comparable to that for the mathematics domain. The median-explained variance in science achievement for mother's education was 6.2%, for father's 6.9%, and for parents' highest education 7.7% (IQRs of 6.0%, 6.7%, and 6.6%, respectively). As was the case for PISA, the associations differed quite markedly across the participating countries.

6.5 Parental Occupation

(Result Tables A.16, A.17, and B.2)

Questions about the financial wellbeing of each student's family were administered in PIRLS and PISA. When making comparisons between these two studies, one first of all needs to take into account that their instruments were administered to different age groups. That said, both studies collected data from parents directly, which might put this constraint into perspective. But then again, administering a questionnaire to parents was a national option in PISA that was chosen by only 16 countries. In addition to collecting data from parents, PISA asked the students to provide information

about the occupations of their parents. In PISA, all information on occupation was transferred to the International Socio-Economic Index of Occupational Status (ISEI; see 3.3.3), thereby transferring the data to a (pseudo-)interval scale level.

6.5.1 Response Rate

The nonresponse rates for data on occupation and financial wellbeing in PIRLS were moderate to high, with medians ranging from 7.5% to 16.8% and high IQRs (from 11.3% to 25.2%). The lowest rate was for the self-reported financial wellbeing of the family (7.5%). The highest median amount of missing data came from the information on the mother's occupation and the father's occupation (both 16.8%). As we have already seen with the other variables of interest, nonresponse in the PIRLS home questionnaire seemed to result from unit nonresponse in some countries rather than from reasons connected to the variables themselves. Similar to information on parental education and language use, information on parents' occupation showed high nonresponse rates in several countries, some of which showed a similar amount of nonresponse (England and Scotland were two such examples, each with a nonresponse rate of approximately 50%).

In PISA, median missing rates were somewhat higher for the occupation data provided by parents than for the occupation data provided by students. Nevertheless, both lots of data had the same pattern. Information about the mother's job that we coded as ISEI was missing for many more students than was the case for information about the father's job (18.7% compared to 12.1% for student-provided data; 37.0% to 22.0% for parent-provided data). The combination of both parents' individual occupations that received the highest ISEI within the family provided the highest amount of valid data, with a median nonresponse rate that was still high at 20.4% for data from the parents (IQR of 20.8%) but low (4.3%) for data from the students (IQR of 3.8%).

The high amount of missing data for the information on parental occupation is, to some extent, due to the fact that people who do not have a regular occupation are not included on the ISEI and are therefore coded as missing data. Such people include apprentices, university students, unemployed people, housewives, and retirees. The nonresponse rates for the white-collar/blue-collar categorization of occupations are the same as for the ISEI variables because the bases of both are the same ISCO-88 codes. In the current study, nonresponse rates for information about mother's white-collar/blue-collar status were the same as those for the parental occupation data because they were derived from the same source of information.

Returning to the country-level results, we can see, once again, big differences across the nonresponse rates of countries. While information about mothers' occupation had the highest nonresponse rates, the combination of both the information from mothers and fathers yielded low nonresponse rates for at least five countries in PIRLS (Hong Kong SAR, Moldova, Poland, the Russian Federation, and Singapore) and for the majority (34) of the countries in PISA.

The nonresponse rate of the information from parents about household income in PISA was high, with a median rate of 22.0% (IQR of 31.7%). The higher amount of nonresponse for this item compared to the item about the family's financial wellbeing in PIRLS could be due to the different item formats. In PIRLS, the question was asked without any reference to absolute numbers (e.g., income) but rather in subjective relation to other families. In PISA, parents were directly asked about their income, or at least asked to select the applicable income-range bracket from among the categories provided.

6.5.2 Association with Achievement

In relative terms, PISA data from students about their parents' occupations showed patterns of nonresponse and association with achievement similar to the patterns for the same information provided by the parents themselves. In absolute values, the information provided by students on the highest parental occupation produced a slightly higher correlation with achievement (0.30 to 0.32 for the three subject domains of the students' data and 0.28 to 0.31 for the parents' data) and explained slightly more of the variance in achievement than did information from parents about their occupations (9.3% to 10.3% for the students' data and 8.0% to 9.5% for the parents' data). In general, associations with achievement were moderate to high for all variables on occupation and income in PISA. Median correlations varied between 0.22 and 0.31, and the median-explained variance ranged from 5.6% to 10.3% (IQRs of 4.1% to 7.0%). The variance included the items about parental occupation as well as the item on household income. The association between the white-collar/blue-collar status of parents and achievement was somewhat weaker, explaining 5.6% to 7.7% of the variance (IQRs of 3.3% to 5.6%). We suspected this pattern would become evident because these indicators reduce the variety of information to four categories only.

A look at the country results reveals some variation across countries. While several countries (Brazil, Bulgaria, Luxembourg, and Portugal) showed high associations with each of the three student-achievement areas for all of the occupation variables, others showed mainly low associations (Hong Kong SAR, Korea, Macao-China, and Qatar). Other countries had a mixture of low and moderate or moderate and high associations.

Correlation and regression analysis could not be completed with the PIRLS data because the information on occupation is provided at nominal scale level only.

6.6 Derived Scales and Indices

From the three studies of interest, only PIRLS and PISA derived scales and indices from separate variables. However, because the two studies surveyed different age populations and because we chose different sets of selected countries for the purposes of this paper, direct comparisons should not be made. We therefore analyzed the scales and indices from the two studies separately. The amount of missing data in the derived scales and indices results from the nonresponse rate for the source variables and from how the separate variables were combined into indices and scales. We

calculated Cronbach's alpha as a reliability coefficient, using all source variables for an index or a scale and following each study's description of how it derived the new variable.

6.6.1 The PIRLS Index of Home Educational Resources (HER)

(Result Tables A.18 and B.1)

The PIRLS Index of Home Educational Resources (HER) in 2006 used source variables from both the student and the parental data (see Section 5.1.1.2 or Foy & Kennedy, 2008c, for details). The index had a moderate nonresponse rate, with a median amount (7.8%) of missing data (IQR of 17.0%) resulting from the nonresponse to the source variables. Several countries (15 in total) had a (very) high nonresponse rate. Twelve other countries showed a low rate.

The median reliability (Cronbach's alpha) of the index across all countries was low, at 0.61³ and an IQR of 0.09, thereby showing a relatively low level of dispersion across the selected countries. The item-total correlation analysis showed, on average across the countries and also within many (35) of them, a poor fit between the home-possession items (ASBGTA1-4) and the index. The reliabilities of the scale in Kuwait (0.37) and Qatar (0.38) were very low compared to those in the other countries. The only countries with a high reliability of the full scale were Bulgaria (0.78) and Iran (0.79).

The index showed a moderate median correlation with reading achievement (0.27) across the countries, with a relatively small dispersion (IQR of 0.08) crossnationally. The median amount of explained variance in students' reading achievement was moderate at 7.5% (IQR of 4.2%). Seven countries—France, Hungary, Iran, Poland, Romania, Singapore, and Sweden—showed a high association.

6.6.2 The PIRLS Index of Early Home Literacy Activities (EHLA)

(Result Tables A.19 and B.1)

The Index of Early Home Literacy Activities (EHLA) in PIRLS 2006 used only student measures as source variables related to literacy activities carried out with the child in the family before he or she began school (see Section 5.1.1.2 or Foy & Kennedy, 2008c). The EHLA showed results similar to those for the HER index: the nonresponse rate was moderate with a median amount of missing data of 6.9% (IQR of 10.4%). The reliability of the index (Cronbach's alpha) was a little higher compared to the HER index and already at a moderate level at 0.68 (IQR of 0.09). With a minimum reliability of 0.60 in Italy and a maximum reliability of 0.79 in Singapore, the index showed a somewhat similar reliability across countries. Changing the composition of the scale would not result in a substantial change in the median reliability given that all items correlated moderately with the scale.

The correlation of the EHLA index with reading achievement was quite low at only 0.17, and the IQR was 0.06, indicating that relatively few countries (11) yielded reasonable

³ We excluded England from the calculation of all median statistics for this index due to the low amount of valid data.

correlations. The median of the explained variance in reading achievement was equally low at only 2.8% (IQR of 2.0%). Only six countries (Austria, Chinese Taipei, Iran, New Zealand, Scotland, and Trinidad and Tobago) showed a moderate association with achievement. Romania was the only country to show a strong association.

6.6.3 The PISA Home Possessions Scale (HOMEPOSS)

(Result Tables A.20⁴ and B.3)

The Home Possessions Scale in PISA (HOMEPOSS) had a very low level of nonresponse, with 0.3% missing data and an IQR of 0.7%. As these percentages already indicate, the level of nonresponse was low for every country. The median reliability of 0.72 (IQR of 0.12) across countries was at a moderate level, with 19 countries at the high level and nine countries at the low level. In terms of nonresponse and reliability, the HOMEPOSS seems to be promising in terms of quality. Changing the composition of the scale by removing one of the items from the scale would not result in substantial change in the median reliability. Still, item-total correlation analysis revealed several items that did not seem to fit well with the scale. Having access to the internet at home was the weakest item, with a low item-total correlation in all but five countries (Azerbaijan, Jordan, Romania, Thailand, and Tunisia).

The scale showed a moderate association with achievement in the three subjects tested in PISA. The median correlation coefficient for mathematics achievement was 0.29 (IQR of 0.11), and the median correlation with reading and science achievement was 0.28 (IQRs of 0.09 and 0.10). The explained variance in achievement was 7.6% for the reading domain (IQR of 5.1%). The amount of variance explained by the Home Possessions Scale was 8.6% (IQR of 6.7%) for mathematics achievement and 8.1% (IQR of 6.0%) for science achievement. In general, the strengths of the associations were similar for the three cognitive domains within each country. In Iceland, the HOMEPOSS did not explain any substantial variance in students' achievement (0.9% in mathematics, 0.3% in reading, and 0.6% in science). Eight other countries had only low associations for all three areas. However, 14 countries showed strong associations with the HOMEPOSS for all three domains.

6.6.4 The PISA Home Educational Resources Scale (HEDRES)

(Result Tables A.21 and B.3)

PISA's Home Educational Resources Scale (HEDRES) also showed a very low nonresponse rate, with the median amount of missing data at 0.6% (IQR of 0.8%). Only Qatar had a moderate nonresponse rate (5.5%). Nevertheless, the median reliability of the scale across the selected countries was quite low (0.53 and an IQR of 0.13). It was, in fact, the lowest of all the PISA-derived scales. Six countries (Bulgaria, Jordan, Romania, Tunisia, Turkey, and Qatar) showed a moderate reliability of the scale; for all other countries, the reliability was low. Changing the composition of the

4 The Cronbach alpha coefficients for the Family Wealth and Home Possessions Scales were computed according to the information provided in the PISA 2006 technical report. However, numbers may not match the ones given in the report (OECD, 2009, pp. 317–318).

scale would not result in substantial change in the median reliability. The item-total correlation was best for the items related to computer aids at home (computer for school work and educational software), with both items showing a moderate median correlation of 0.33 (IQRs of 0.14 and 0.18). All other items correlated to a low extent only with the total scale.

The correlations between the HEDRES and reading, mathematics, and science achievement were moderate, with 0.26, 0.26, and 0.25 for the three subject domains (IQRs of 0.08, 0.14, and 0.13). The median amount of variance explained by the scale in reading, mathematics, and science achievement was between 6.0% and 6.8% (IQRs from 4.4% to 7.0%). Again, the diversity of the results at the country level was considerable. Whereas 11 countries showed a strong association with all three domains, 14 countries had low associations. Nevertheless, given the low reliability of the measure in most of the countries, none of these results can be trusted.

6.6.5 The PISA Cultural Possessions Scale (CULTPOSS)

(Result Tables A.22 and B.3)

PISA's Cultural Possessions Scale (CULTPOSS) showed, yet again, a very low amount of missing data (1.5% and an IQR of 1.8%), and only four countries (Germany, Israel, Kyrgyzstan, and Qatar) with a moderate nonresponse rate, but also a low reliability of 0.60 and a relatively low dispersion across countries (IQR of 0.08). Only 10 countries yielded a moderate scale-reliability. Removing Item ST13Q10 (works of art) from the scale improved its median reliability (0.62), but not substantially so. Although showing the weakest item-total correlation amongst the three variables comprising the scale, the item nonetheless had a moderate correlation with the total scale.

The correlation with achievement was moderate: 0.25 for reading, 0.23 for mathematics, and 0.26 for science, with dispersion of 0.10, 0.09, and 0.08, respectively. The explained variance, at between 5.3% and 6.9% (IQRs of 4.1% to 5.1%), indicated some variation across countries. There were also differences between the subject areas. Whereas only three countries showed a high amount of explained variance with mathematics achievement, 13 countries showed a high amount with regard to reading achievement.

6.6.6 The PISA Index of Wealth Possessions (WEALTH)

(Result Tables A.23⁵ and B.3)

The PISA Index of Wealth Possessions (WEALTH) also showed a low median reliability of 0.61 (IQR of 0.12). Four countries had high reliabilities, but the majority of countries (39) had only a low reliability. Removing one of the items from the scale did not improve its reliability. All items correlated moderately with it: the items on possessing cellphones and televisions showed low correlations in a couple of countries. As the value of the dispersion indicates, there was some variation across countries with respect to the reliability of the scale.

⁵ The Cronbach alpha coefficients for the Family Wealth and Home Possessions Scales were computed according to the information provided in the PISA 2006 technical report. However, numbers may not match those given in the report (OECD, 2009, pp. 317–318).

The median amount of missing data was not only low at 0.3% (IQR of 0.7%) but also low for every country. The association with achievement was, however, weak: for reading it was 0.12, mathematics 0.17, and science 0.14. Moreover, the IQRs for these correlation coefficients showed quite high dispersion across the countries: the values of the IQRs were around the same value as the correlation coefficients (0.13 for all three domains). The amount of explained variance for reading was 1.6%, for mathematics 2.8%, and for science 2.1%, and the corresponding dispersions, when compared to the absolute values of the medians, were somewhat high at 4.6%, 2.8%, and 3.9%. Only two countries (Brazil and Chile) had a high amount of explained variance for all three subject domains. However, 12 countries had almost no explained variance (less than 1.0%) for any of the three subject areas.

6.6.7 The PISA Index of Economic, Social, and Cultural Status (ESCS)

(Result Tables A.24 and B.3)

The reliability for the Index of Economic, Social, and Cultural Status (ESCS) was moderate (0.68 and an IQR of 0.10). Because the index is composed of three scales that represent three different constructs, we could expect the reliability to increase if we removed one of the scales from the index. The scales comprising the index correlated moderately (HISEI and HOMEPOS) and even highly (PARED) with the index. There was some variation across the countries with respect to the reliability of the ESCS index: 18 countries showed a low reliability and five countries a high reliability.

The amount of missing data was low, with a median nonresponse rate of 0.6% (IQR of 0.8%). Only Israel showed a moderate rate of nonresponse (5.2%). The correlations of this index with achievement were not only high for all three subjects but also the strongest of all the indices and scales for both studies, with a median correlation of 0.35 for reading, 0.37 for mathematics, and 0.37 for science, and IQRs of 0.09, 0.08, and 0.10, respectively. This pattern also applied to the amount of the variance explained by this variable, with median variances of 12.0% for reading achievement (IQR of 5.7%), 13.9% for science (IQR of 7.2%), and 13.6% for mathematics achievement (IQR of 6.2%). This finding was not unexpected because the index combines information and explanatory power from three sources derived from many separate variables (the index of home possessions, the highest ISEI, and parental education, defined in terms of years of schooling). Most countries showed a strong association with each of the three areas of achievement at (well) above 10.0% of the explained variance. The only countries where the associations were low for all three areas were Macao-China and Qatar.