Appendix B

Characteristics of National Samples

B.1 Armenia

A single school sample was used for both advanced mathematics and physics.

Advanced mathematics and physics

Coverage and Exclusions

- Coverage of the national desired target populations was 100%.
- There were no school-level exclusions prior to sampling.
- There were no within-sample exclusions.

Sample Design

- All schools with eligible students were selected for the data collection sample.
- There was no explicit or implicit stratification.
- Two classes were sampled per school, whenever possible.
- Half of the students in the selected classes were assigned randomly an advanced mathematics booklet; the other half were assigned a physics booklet.

Field Test Sample

- Six schools were sampled for the field test and used for both populations.
- Field test schools also were included in the data collection sample.

Notes on Sampling Weights

- The target population definitions in Armenia were finalized after the school sample had been selected. As a result, a smaller than expected sample of schools was available for analysis.
- In schools where all eligible classes were selected, classes were treated as strata and were randomly divided into two replicates for variance estimation.
- In schools where eligible classes were sampled, schools were treated as strata and classes as replicates for variance estimation.

Exhibit B.1 School Sample Allocation in Armenia

Advanced Mathematics and Physics							
Explicit Stratum	Total Sampled Schools	Ineligible Schools	Excluded Schools	Participating Schools			Non-Participating Schools
				Sampled	First Replacement	Second Replacement	
Armenia	38	0	0	38	0	0	0
Total	**38**	**0**	**0**	**38**	**0**	**0**	**0**

B.2 Islamic Republic of Iran

A single school sample was used for both advanced mathematics and physics.

Advanced mathematics and physics

Coverage and Exclusions

- Coverage of the national desired target populations was 100%.
- There were no school-level exclusions prior to sampling.
- There were no within-sample exclusions.

Sample Design

- Schools were stratified explicitly by school type (public, private) and gender (boys, girls), for a total of four explicit strata.
- Schools were stratified implicitly by province (31 provinces), for a total of 124 implicit strata.
- Because many sampled schools had been merged or closed, replacement of these ineligible schools was necessary—and approved by the sampling consultants—to prevent a significant drop in sample size.
- Two classes were sampled in schools with at least 90 eligible students; one class was sampled per school otherwise.
- Half of the students in the selected classes were assigned randomly an advanced mathematics booklet; the other half were assigned a physics booklet.

Field Test Sample

- Thirty schools were sampled for the field test at the same time as the data collection sample, thus no schools were selected for both activities.

Notes on Sampling Weights

- A school sampling weight adjustment was computed to account for the 10 ineligible schools that were replaced such that the school sampling weights of the 119 participating schools would represent only the 110 eligible schools.

Exhibit B.2 School Sample Allocation in Iran

Advanced Mathematics and Physics							
Explicit Stratum	Total Sampled Schools	Ineligible Schools	Excluded Schools	Participating Schools			Non-Participating Schools
				Sampled	First Replacement	Second Replacement	
Public schools for girls	44	3	0	41	3	0	0
Public schools for boys	48	3	0	45	3	0	0
Private schools for girls	10	1	0	9	1	0	0
Private schools for boys	18	3	0	14	3	0	1
Total	**120**	**10**	**0**	**109**	**10**	**0**	**1**

B.3 Italy

The sample design for Italy differed from the standard TIMSS Advanced design. First, a single sample of schools was selected for both study populations. Then, the sampled schools were allocated randomly to advanced mathematics, physics, or both.

Advanced mathematics and physics

Coverage and Exclusions

- Coverage of the national desired target populations was 100%.
- There were no school-level exclusions prior to sampling.
- Within-sample exclusions consisted of an excluded class, special needs students, and non-native language speakers, for exclusion rates of 0.53% for advanced mathematics and 0.95% for physics.
- Physics students were found in one school from the first explicit stratum, where only advanced mathematics students were expected. As a result, the reported physics exclusion rate is underestimated. Unfortunately, the sample design did not allow estimation of this specific type of exclusion.

Sample Design

- The measure of size for sample selection was total enrollment in the 13th grade.
- Schools were stratified explicitly by the presence of eligible classes from the two study populations:
  - Schools with an advanced mathematics program;
  - Schools with an advanced mathematics program and an advanced mathematics and physics program;
  - Schools with an advanced mathematics and physics program.

- Schools were stratified implicitly by region (20 regions), for a total of 56 implicit strata.
- After school sampling, the schools in the second and third explicit strata were allocated to the two study populations as follows:
  - All 82 schools in the second explicit stratum were allocated to physics, but only 42 of them were allocated randomly to advanced mathematics.
  - Of the 36 schools in the third explicit stratum, 6 schools were allocated randomly to advanced mathematics, and the remaining 30 schools were allocated to physics.
- Class sampling and booklet assignment varied across the explicit strata and from the random allocation of sampled schools to the study populations, as follows:
  - In the first explicit stratum, one advanced mathematics class was sampled per school and only the advanced mathematics booklets were administered.
  - In the 40 schools of the second explicit stratum that were allocated only to physics, two physics classes were sampled, whenever possible, and only the physics booklets were administered.
  - In the 42 schools of the second explicit stratum that were allocated to both populations, one class from the advanced mathematics program and one class from the advanced mathematics and physics program were sampled. In the class selected from the advanced mathematics program, the advanced mathematics booklets were administered; in the class selected from the advanced mathematics and physics program, half of the students were assigned randomly an advanced mathematics booklet and the other half were assigned a physics booklet.

- In the third explicit stratum, one class was sampled per school. The advanced mathematics booklets were administered in the 6 schools allocated to advanced mathematics and the physics booklets were administered in the 30 schools allocated to physics.

Field Test Sample

- A field test was administered in Italy, but the data were not available for international analysis. Schools in the field test were eligible for selection in the data collection sample.

Notes on Sampling Weights

- Many sampled schools were found to be ineligible as they did not have any advanced mathematics or physics students. In many other schools, the number of eligible students was smaller than expected. As a result, the estimated student population sizes are smaller than the population sizes estimated from the sampling frame.

Special Note

- In Italy, the booklet assignment did not follow strictly the rules in classes where both advanced mathematics and physics booklets were distributed, but booklets still were distributed in a random manner.

Exhibit B.3 School Sample Allocation in Italy

Advanced Mathematics

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Excluded Schools	Participating Schools			Non-Participating Schools
				Sampled	First Replacement	Second Replacement	
Schools with an advanced mathematics program	52	3	0	46	2	0	1
Schools with an advanced mathematics program and an advanced mathematics and physics program	42	4	0	38	0	0	0
Schools with an advanced mathematics and physics program	6	2	0	4	0	0	0
Total	**100**	**9**	**0**	**88**	**2**	**0**	**1**

Physics

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Excluded Schools	Participating Schools			Non-Participating Schools
				Sampled	First Replacement	Second Replacement	
Schools with an advanced mathematics program and an advanced mathematics and physics program	82	14	0	68	0	0	0
Schools with an advanced mathematics and physics program	30	7	0	23	0	0	0
Total	**112**	**21**	**0**	**91**	**0**	**0**	**0**

B.4 Lebanon

A single school sample was used for both advanced mathematics and physics.

Advanced mathematics and physics

Coverage and Exclusions

- Coverage of the national desired target populations was 100%.
- School-level exclusions prior to sampling consisted of 33 very small schools (less than 4 eligible students), for a total of 64 students and an exclusion rate of 1.25%.
- There were no within-sample exclusions.

Sample Design

- Schools were stratified explicitly by school size (large, small), for a total of two explicit strata.
- Schools were stratified implicitly by region (6 regions) and school type (public, private), for a total of 24 implicit strata.
- All schools from the large schools explicit stratum were selected; schools from the small schools explicit stratum were sampled with equal probabilities.
- All eligible classes in the selected schools were sampled.
- Half of the students in the selected classes were assigned randomly an advanced mathematics booklet; the other half were assigned a physics booklet.

Field Test Sample

- Lebanon did not carry out a field test.

Notes on Sampling Weights

- In all but three schools in the large schools explicit stratum, all classes were selected and classes were treated as strata and were randomly divided into two replicates for variance estimation. The other three schools were treated as strata and the classes as replicates for variance estimation.
- Two schools in the large schools explicit stratum did not meet the class-level student participation requirements for physics and consequently were treated as non-participating schools for physics.

Exhibit B.4 School Sample Allocation in Lebanon

Advanced Mathematics							
Explicit Stratum	Total Sampled Schools	Ineligible Schools	Excluded Schools	Participating Schools			Non-Participating Schools
				Sampled	First Replacement	Second Replacement	
Large schools	102	0	0	92	0	0	10
Small schools	138	0	0	111	9	0	18
Total	**240**	**0**	**0**	**203**	**9**	**0**	**28**

Physics							
Explicit Stratum	Total Sampled Schools	Ineligible Schools	Excluded Schools	Participating Schools			Non-Participating Schools
				Sampled	First Replacement	Second Replacement	
Large schools	102	0	0	90	0	0	12
Small schools	138	0	0	111	9	0	18
Total	**240**	**0**	**0**	**201**	**9**	**0**	**30**

B.5 Netherlands

Two separate school samples were selected for advanced mathematics and physics.

Advanced mathematics

Coverage and Exclusions

- Coverage of the national desired target population was 100%.
- School-level exclusions prior to sampling consisted of schools that had participated in the field test, for a total of 179 students and an exclusion rate of 2.5%.
- There were no within-sample exclusions.
- A small number of students were allowed to take their final examinations prior to the TIMSS Advanced assessments and thus were excluded from the advanced mathematics assessment because they were no longer in their advanced mathematics classes. The size of this exclusion could not be estimated.

Sample Design

- There was no explicit nor implicit stratification.
- Schools were sampled with equal probabilities.
- All eligible advanced mathematics classes in the selected schools were sampled.

Field Test Sample

- A convenience sample of six schools was selected for the field test and used for both populations. These schools were excluded from the sampling frame prior to selecting the schools for the data collection sample.

Physics

Coverage and Exclusions

- Coverage of the national desired target population was 100%.
- School-level exclusions prior to sampling consisted of the six schools that had participated in the field test, for a total of 179 students and an exclusion rate of 2.5%.
- Within-sample exclusions consisted of special needs students, for an exclusion rate of 0.2%.
- A small number of students were allowed to take their final examinations prior to the TIMSS Advanced assessments and were excluded from the physics assessment because they were no longer in their physics classes. The size of this exclusion could not be estimated.

Sample Design

- There was no explicit nor implicit stratification.
- Schools were sampled with equal probabilities.
- All eligible physics classes in the selected schools were sampled.

Field Test Sample

- A convenience sample of six schools was selected for the field test and used for both populations. These schools were excluded from the sampling frame prior to selecting the schools for the data collection sample.

Exhibit B.5 School Sample Allocation in the Netherlands

Advanced Mathematics

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Excluded Schools	Participating Schools			Non-Participating Schools
				Sampled	First Replacement	Second Replacement	
Netherlands	135	2	0	102	9	1	21
Total	**135**	**2**	**0**	**102**	**9**	**1**	**21**

Physics

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Excluded Schools	Participating Schools			Non-Participating Schools
				Sampled	First Replacement	Second Replacement	
Netherlands	135	2	0	98	16	1	18
Total	**135**	**2**	**0**	**98**	**16**	**1**	**18**

B.6 Norway

All eligible schools in Norway were selected for TIMSS Advanced 2008, but each school was selected for only one population, resulting in two separate school samples for advanced mathematics and physics.

Advanced Mathematics

Coverage and Exclusions

- Coverage of the national desired target population was 100%.
- School-level exclusions prior to sampling consisted of 15 very small schools, for a total of 66 students and an exclusion rate of 0.88%.
- Within-sample exclusions consisted of non-native language speakers, for an exclusion rate of 0.14%.

Sample Design

- Schools were stratified explicitly by the presence of eligible classes from the two study populations (advanced mathematics classes, advanced mathematics classes and physics classes) and the number of eligible physics students (less than 10, between 10 and 19, between 20 and 34, 35 or more), for a total of 5 explicit strata.
- There was no implicit stratification.
- All schools from the explicit stratum of advanced mathematics classes were selected.
- Schools were sampled with equal probabilities in the remaining explicit strata.
- Two advanced mathematics classes were sampled in schools with at least 60 eligible students; one advanced mathematics class was sampled per school otherwise.

Field Test Sample

- A sample of 25 schools was selected for the field test and used for both populations. Schools in the field test were eligible for selection in the data collection sample.

Physics

Coverage and Exclusions

- Coverage of the national desired target population was 100%.
- School-level exclusions prior to sampling consisted of 15 very small schools, for a total of 18 students and an exclusion rate of 0.4%.
- Within-sample exclusions consisted of special needs students, for an exclusion rate of 0.05%.

Sample Design

- Schools were stratified explicitly by the presence of eligible classes from the two study populations (physics classes, advanced mathematics classes and physics classes) and the number of eligible physics students (less than 10, between 10 and 19, between 20 and 34, 35 or more), for a total of five explicit strata.
- There was no implicit stratification.
- All schools from the explicit stratum of physics classes were selected.
- Schools were sampled with equal probabilities in the remaining explicit strata.
- All eligible physics classes in the selected schools were sampled.

Field Test Sample

- A sample of 25 schools was selected for the field test and used for both populations. Schools in the field test were eligible for selection in the data collection sample.

Exhibit B.6 School Sample Allocation in Norway

Advanced Mathematics

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Excluded Schools	Participating Schools			Non-Participating Schools
				Sampled	First Replacement	Second Replacement	
Schools with advanced mathematics classes	12	0	0	9	0	0	3
Schools with advanced mathematics classes and physics classes and 35 or more physics students	15	0	0	15	0	0	0
Schools with advanced mathematics classes and physics classes and 20 to 34 physics students	24	0	0	22	0	0	2
Schools with advanced mathematics classes and physics classes and 10 to 19 physics students	37	0	0	36	0	0	1
Schools with advanced mathematics classes and physics classes and less than 10 physics students	32	0	0	25	0	0	7
Total	**120**	**0**	**0**	**107**	**0**	**0**	**13**

Physics

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Excluded Schools	Participating Schools			Non-Participating Schools
				Sampled	First Replacement	Second Replacement	
Schools with physics classes	1	0	0	1	0	0	0
Schools with advanced mathematics classes and physics classes and 35 or more physics students	18	0	0	16	0	0	2
Schools with advanced mathematics classes and physics classes and 20 to 34 physics students	29	0	0	24	0	0	5
Schools with advanced mathematics classes and physics classes and 10 to 19 physics students	42	0	0	35	0	0	7
Schools with advanced mathematics classes and physics classes and less than 10 physics students	30	0	0	25	0	0	5
Total	**120**	**0**	**0**	**101**	**0**	**0**	**19**

B.7 Philippines

The Philippines participated in the advanced mathematics assessment only.

Advanced Mathematics

Coverage and Exclusions

- Coverage of the national desired target population was 100%.
- There were no school-level exclusions prior to sampling.
- There were no within-sample exclusions.

Sample Design

- Schools were stratified explicitly by their orientation (science and technology, other) and information about school size (size known, size unknown), for a total of four explicit strata.
- Schools were stratified implicitly by type (Philippines science high school system, regional science high schools, other public science high schools, other private high schools, university rural high schools and laboratory schools) in the explicit stratum of other schools, for a total of 10 implicit strata.
- Schools were sampled with equal probabilities in all explicit strata.
- One advanced mathematics class was sampled per school.

Field Test Sample

- The Philippines did not carry out a field test.

Notes on Sampling Weights

- From the original sample of 126 schools, a sub-sample of 123 schools was selected to reduce the sample size. The school sampling weights were adjusted to account for this sub-sampling.
- After the school sample was selected, two duplicate schools were found in the sample. The sampling weights were corrected to account for this duplication upon confirmation from the NRC that there were no other such cases on the sampling frame.
- Two schools, identified as outliers in terms of achievement, had their school weights set to 1 to stabilize variance estimation.

Exhibit B.7 School Sample Allocation in the Philippines

Advanced Mathematics

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Excluded Schools	Participating Schools			Non-Participating Schools
				Sampled	First Replacement	Second Replacement	
Science and technology schools of known size	53	0	0	53	0	0	0
Science and technology schools of unknown size	23	1	0	22	0	0	0
Other schools of known size	32	0	0	32	0	0	0
Other schools of unknown size	13	0	0	11	0	0	2
Total	**121**	**1**	**0**	**118**	**0**	**0**	**2**

B.8 Russian Federation

Two separate school samples were selected for advanced mathematics and physics.

Advanced Mathematics

Coverage and Exclusions

- Coverage of the national desired target population was 100%.
- There were no school-level exclusions prior to sampling.
- There were no within-sample exclusions.

Sample Design

- In a preliminary sampling stage, a sample of 43 regions out of 85 was selected with probabilities proportional to size. The 19 largest regions were selected with certainty.
- In the 19 certainty regions, schools were stratified explicitly by the presence of eligible classes from the two study populations (advanced mathematics classes, advanced mathematics classes and physics classes). They also were stratified implicitly by the 19 regions and 9 levels of urbanization.
- Each of the remaining sampled regions became an explicit stratum. Half of the schools that offered both advanced mathematics classes and physics classes were allocated randomly to the advanced mathematics assessment and added to the schools with only advanced mathematics classes prior to sampling (the other half was allocated to the physics assessment). These schools were stratified implicitly by seven levels of urbanization.
- One advanced mathematics class was sampled per school.

Field Test Sample

- A convenience sample of 23 schools from 3 regions was selected for the field test and used for both populations. Schools in the field test were eligible for selection in the data collection sample.

Notes on Sampling Weights

- School weights were adjusted to take into account the sampling of regions.
- In the sampled regions, the sampling weights of schools with both advanced mathematics classes and physics classes were adjusted to account for their random allocation to the advanced mathematics assessment.
- The sampled regions were treated as replicates for variance estimation.

Physics

Coverage and Exclusions

- Coverage of the national desired target population was 100%.
- There were no school-level exclusions prior to sampling.
- There were no within-sample exclusions.

Sample Design

- In a preliminary sampling stage, a sample of 43 regions out of 85 was selected with probabilities proportional to size. The 19 largest regions were selected with certainty.
- In the 19 certainty regions, schools were stratified explicitly by the presence of eligible classes from the two study populations (physics

classes, advanced mathematics classes and physics classes). They also were stratified implicitly by the 19 regions and 9 levels of urbanization.

- Each of the remaining sampled regions became an explicit stratum. Half of the schools that offered both advanced mathematics classes and physics classes were allocated randomly to the physics assessment and added to the schools with only physics classes prior to sampling (the other half was allocated to the advanced mathematics assessment). These schools were stratified implicitly by seven levels of urbanization.
- One physics class was sampled per school.

Field Test Sample

- A convenience sample of 23 schools from 3 regions was selected for the field test and used for both populations. Schools in the field test were eligible for selection in the data collection sample.

Notes on Sampling Weights

- School weights were adjusted to take into account the sampling of regions.
- In the sampled regions, the sampling weights of schools with both advanced mathematics classes and physics classes were adjusted to account for their random allocation to the physics assessment.
- The sampled regions were treated as replicates for variance estimation.

Exhibit B.8 School Sample Allocation in the Russian Federation

Advanced Mathematics

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Excluded Schools	Participating Schools			Non-Participating Schools
				Sampled	First Replacement	Second Replacement	
Schools in certainty regions with advanced mathematics classes	15	0	0	15	0	0	0
Schools in certainty regions with advanced mathematics classes and physics classes	50	0	0	50	0	0	0
Schools in sampled regions with advanced mathematics classes	78	0	0	78	0	0	0
Total	**143**	**0**	**0**	**143**	**0**	**0**	**0**

Physics

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Excluded Schools	Participating Schools			Non-Participating Schools
				Sampled	First Replacement	Second Replacement	
Schools in certainty regions with physics classes	42	0	0	42	0	0	0
Schools in certainty regions with advanced mathematics classes and physics classes	27	0	0	27	0	0	0
Schools in sampled regions with physics classes	80	0	0	80	0	0	0
Total	**149**	**0**	**0**	**149**	**0**	**0**	**0**

B.9 Slovenia

All schools in Slovenia with eligible students were selected for participation in TIMSS Advanced 2008. There were 87 schools with eligible students in advanced mathematics. There were 66 schools with eligible students in physics, which also were in the advanced mathematics sample, and all eligible physics students took part in the physics assessment. Since all 66 physics schools also were eligible for the advanced mathematics assessment, some students were selected for both assessments. The two assessments were scheduled on different days to accommodate this and a random mechanism determined which assessment was administered first in each school.

Advanced Mathematics

Coverage and Exclusions

- Coverage of the national desired target population was 100%.
- There were no school-level exclusions prior to sampling.
- Within-sample exclusions consisted of one excluded school—a Waldorf school—and special needs students, for an exclusion rate of 1.3%.

Sample Design

- All schools with eligible students were selected.
- Schools were stratified explicitly by the presence of eligible classes from the two study populations (advanced mathematics classes, advanced mathematics classes and physics classes) and the number of mathematics experts (many, few), for a total of three explicit strata. Schools with "many experts" were defined as those schools in which a high proportion of students—25 percent or more—registered for an advanced-level test in their final-year examinations during the 2007/2008 school year.

- There was no implicit stratification.
- Two advanced mathematics classes were sampled per school in the explicit stratum of advanced mathematics classes and physics classes with many experts; one advanced mathematics class was sampled per school otherwise.

Field Test Sample

- A sample of 22 schools with advanced mathematics classes and physics classes was selected and used for both populations. Schools in the field test also were part of the data collection sample.

Notes on Sampling Weights

- In schools where classes were sampled, schools were treated as strata and classes as replicates for variance estimation. If only one class was sampled in a school, the selected class was randomly divided into two replicates for variance estimation.
- In schools where all eligible classes were selected, classes were treated as strata and were randomly divided into two replicates for variance estimation.

Physics

Coverage and Exclusions

- Coverage of the national desired target population was 100%.
- There were no school-level exclusions prior to sampling.
- Within-sample exclusions consisted of one excluded school—a Waldorf school—and special needs students, for an exclusion rate of 0.5%.

Sample Design

- All schools with eligible students were selected.
- Schools were stratified explicitly by the number of mathematics experts (many, few), for a total of two explicit strata.
- There was no implicit stratification.
- All eligible physics classes in the selected schools were sampled.

Field Test Sample

- A sample of 22 schools with advanced mathematics classes and physics classes was selected and used for both populations. Schools in the field test also were part of the data collection sample.

Notes on Sampling Weights

- In all participating schools, classes were treated as strata and were randomly divided into two replicates for variance estimation.

Exhibit B.9 School Sample Allocation in Slovenia

Advanced Mathematics

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Excluded Schools	Participating Schools			Non-Participating Schools
				Sampled	First Replacement	Second Replacement	
Schools with advanced mathematics classes and physics classes and many experts	15	0	0	15	0	0	0
Schools with advanced mathematics classes and physics classes and few experts	51	1	1	48	0	0	1
Schools with advanced mathematics classes	21	3	0	16	0	0	2
Total	**87**	**4**	**1**	**79**	**0**	**0**	**3**

Physics

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Excluded Schools	Participating Schools			Non-Participating Schools
				Sampled	First Replacement	Second Replacement	
Schools with advanced mathematics classes and physics classes and many experts	15	0	0	13	0	0	2
Schools with advanced mathematics classes and physics classes and few experts	51	1	1	41	0	0	8
Total	**66**	**1**	**1**	**54**	**0**	**0**	**10**

B.10 Sweden

All eligible schools in Sweden were selected for TIMSS Advanced 2008, but each school was selected for only one population, resulting in two separate school samples for advanced mathematics and physics.

Advanced Mathematics

Coverage and Exclusions

- Coverage of the national desired target population was 100%.
- School-level exclusions prior to sampling consisted of 25 very small schools (less than 7 students from the natural science program or less then 5 students from the technology program) and 2 additional small schools, for a total of 177 students and an exclusion rate of 1.5%.
- Within-sample exclusions consisted of one excluded school—with an alternate curriculum—and special needs students, for an exclusion rate of 0.3%.

Sample Design

- Schools were stratified explicitly by the presence of eligible classes from the two study populations (advanced mathematics classes, advanced mathematics classes and physics classes), the presence of the two eligible programs (natural science, technology, both programs) in the stratum of schools with advanced mathematics classes and physics classes, and school type (public, private), for a total of six explicit strata. Private schools offered only the natural science program.
- There was no implicit stratification.

- All schools in the explicit stratum of advanced mathematics classes were selected.
- Schools were sampled with equal probabilities in the remaining explicit strata.
- In the explicit stratum of schools with advanced mathematics classes and physics classes and both programs, the sampled schools provided classes from only one of the two programs through a random mechanism.
- Since it was not always possible to identify all eligible advanced mathematics students from the final-year advanced mathematics classes (in some schools, students took the advanced mathematics course in the 11th grade or at the beginning of their final year), they were identified through home classes in their final year of secondary school (12th grade). A home class from the natural science program consisted entirely of eligible students, whereas a home class from the technology program included ineligible students that were removed from the advanced mathematics assessment.
- Two advanced mathematics classes were sampled in schools with at least 100 eligible students; one advanced mathematics class was sampled per school otherwise. Occasionally, two advanced mathematics classes were sampled in additional schools to increase the student sample size.

Field Test Sample

- A sample of 25 schools was selected for the field test and used for both populations. Field test schools were eligible as replacement schools in the data collection sample.

Notes on Sampling Weights

- In the explicit stratum of schools with advanced mathematics classes and physics classes and both programs, the school sampling weights were adjusted to account for the random mechanism that determined which program provided eligible classes for sampling.

Physics

Coverage and Exclusions

- Coverage of the national desired target population was 100%.
- School-level exclusions prior to sampling consisted of 23 very small schools (less than seven students from the natural science program or less then five students from the technology program), for a total of 218 students and an exclusion rate of 2.15%.
- Within-sample exclusions consisted of special students, for an exclusion rate of 0.16%.

Sample Design

- Schools were stratified explicitly by the presence of the two eligible programs (natural science, technology, both programs) and school type (public, private), for a total of four explicit strata. Private schools offered only the natural science program.
- There was no implicit stratification.
- Schools were sampled with equal probabilities.
- In the explicit stratum of schools with advanced mathematics classes and physics classes and both programs, the sampled schools provided classes from only one of the two programs through a random mechanism.

- Since it was not always possible to identify all eligible physics students from the final-year physics classes (in some schools, students took the physics course at the beginning of their final year), they were identified through home classes in their final year of secondary school (12^{th} grade). A home class from the natural science program consisted entirely of eligible students, whereas a home class from the technology program included ineligible students that were removed from the physics assessment.
- Two physics classes were sampled in schools with at least 75 eligible students; one physics class was sampled per school otherwise. Occasionally, two physics classes were sampled in additional schools to increase the student sample size.

Field Test Sample

- A sample of 25 schools was selected for the field test and used for both populations. Field test schools were eligible as replacement schools in the data collection sample.

Notes on Sampling Weights

- In the explicit stratum of schools with advanced mathematics classes and physics classes and both programs, the school sampling weights were adjusted to account for the random mechanism that determined which program provided eligible classes for sampling.

Exhibit B.10 School Sample Allocation in Sweden

Advanced Mathematics

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Excluded Schools	Participating Schools			Non-Participating Schools
				Sampled	First Replacement	Second Replacement	
Public schools with advanced mathematics classes from the natural science program	6	0	0	6	0	0	0
Private schools with advanced mathematics classes from the natural science program	5	0	0	3	0	0	2
Schools with advanced mathematics classes and physics classes from both programs	52	0	0	47	4	0	1
Public schools with advanced mathematics classes and physics classes from the natural science program	38	0	0	35	1	0	2
Private schools with advanced mathematics classes and physics classes from the natural science program	20	0	1	14	0	0	5
Schools with advanced mathematics classes and physics classes from the technology program	6	0	0	6	0	0	0
Total	**127**	**0**	**1**	**111**	**5**	**0**	**10**

Physics

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Excluded Schools	Participating Schools			Non-Participating Schools
				Sampled	First Replacement	Second Replacement	
Schools with advanced mathematics classes and physics classes from both programs	63	1	0	60	0	0	2
Public schools with advanced mathematics classes and physics classes from the natural science program	36	0	0	35	1	0	0
Private schools with advanced mathematics classes and physics classes from the natural science program	20	0	0	18	0	0	2
Schools with advanced mathematics classes and physics classes from the technology program	8	1	0	6	1	0	0
Total	**127**	**2**	**0**	**119**	**2**	**0**	**4**