CAN EDUCATIONAL SYSTEMS COMPENSATE FOR SOCIETAL FEATURES?
THE EFFECTS OF EDUCATIONAL SYSTEMS AND SOCIETAL FEATURES OF BOTH COUNTRIES OF ORIGIN AND DESTINATION ON THE SCIENTIFIC LITERACY OF IMMIGRANT CHILDREN IN WESTERN COUNTRIES

M. de Heus & J. Dronkers

last update: 14 June 2008

Paper presented at the *International Conference on Survey Methods in Multinational, Multiregional, and Multicultural Contexts (3MC)*,
Berlin-Brandenburg Academy of Sciences and Humanities, June 25-28, 2008

CAN EDUCATIONAL SYSTEMS COMPENSATE FOR SOCIETAL FEATURES? THE EFFECTS OF EDUCATIONAL SYSTEMS AND SOCIETAL FEATURES OF BOTH COUNTRIES OF ORIGIN AND DESTINATION ON THE SCIENTIFIC LITERACY OF IMMIGRANT CHILDREN IN WESTERN COUNTRIES

M. de Heus and J. Dronkers[1]

All correspondence to Jaap Dronkers, SPS Department, EUI, Via dei Roccettini 9, I-50014 San Domenico di Fiesole (FI), Italy. E-mail: jaap.dronkers@eui.eu

Abstract
This paper explores the extent to which educational systems and general societal features of destination and origin countries can explain differences in immigrant children's scientific literacy. Using data from the 2006 PISA survey, we performed cross-classified multilevel analysis on the science performance of 9414 15-year-old immigrant children, originating from 46 different countries, living in 16 countries of destination. De Heus, Dronkers, and Levels (in press) have already demonstrated that several educational system features of both immigrants' countries of origin and destination influence their educational achievement. Alongside educational system features, this study takes into account several policy measures and general societal features in order to find out what matters most for immigrants' scientific performance: educational systems or other societal characteristics? Results show that both educational system features and societal characteristics account for differences in educational achievement between immigrants. Particularly striking is the substantial effect origin countries' religious affiliations have on the scientific performance of children originating from these countries. Immigrant children from Islamic countries perform worse than their counterparts from Christian or non-religious countries. After taking into account a wide range of societal features at both the origin and the destination level, educational system features such as the duration of compulsory education in immigrants' origin countries continues to have a positive influence on the educational achievement of (especially) first generation immigrants.

Keywords: immigration, origin, destination, educational system, educational performance, PISA

Introduction

Today, most Western societies host a substantial and still growing immigrant population. Technological developments such as the internet and (mobile) telephone communication, increased and less expensive ways of long-distance travel, and the emergence of the European Union, have each helped to facilitate migration. However, since these developments at the same time allow for the maintenance of closer links to the country of origin than ever before, immigrants nowadays are often said to be less motivated to integrate into the new country of destination. Newspaper slogans such as 'Turkish men recruit brides from Russia' (the Netherlands, *Trouw*), 'Influx of immigrants costs every UK household 350 pounds a year' (United Kingdom, *Daily Mail*), and 'Is it just a matter of time before we all speak Chinese?' (Germany, *Frankfurter Allgemeine*) are a reflection of the prominent position of immigration in contemporary societies and politics.

The increasing political and societal focus on immigration has not been ignored by sociological literature. To identify the causes of immigrant outcomes such as their economic integration, educational attainment, and destination-language proficiency, researchers have

relied on both micro and macro perspectives. On the individual level, it has, for instance, been shown that immigrants who migrate at a young age, who have been resident in the destination country for a long time, and those with a higher education, have a better economic position (Chiswick and Miller, 2002) and a better command of their host country's official language (Chiswick and Miller, 1996). With regard to educational attainment, studies conducted in the United States have shown that Latino's and Blacks have lower average grades than native Americans (Bankston and Zhou, 2002), that second generation immigrants with a native-born mother have higher chances of graduating from college than second generation immigrants with two foreign born parents, and that immigrant boys have higher chances of graduating from college than immigrant girls (Ramakrishban, 2004). On the macro-level, the introduction of a cross-classified multilevel design has allowed researchers to take into account features of immigrants' origin countries and features of immigrants' destination countries simultaneously in order to explain all kinds of immigrant outcomes.

This study builds upon Levels, Dronkers, and Kraaykamp (2008) and de Heus, Dronkers, and Levels (in press) and focuses on the influence of both societal and educational system characteristics of immigrants' countries of origin and destination on their educational achievement. In doing so, it aims to combine two lines of research: one focussing on the influence of countries' immigrant policies and other macro-characteristics, the other focussing on countries' educational system characteristics. Both lines of research will be described below. To gain a broader understanding of which and how countries' macro-characteristics have been studied the description will also take into account studies focussing on other dimensions of immigrant integration than educational achievement.

Countries' immigrant policies and other macro-characteristics

One of the first studies that proposed a more comprehensive perspective on the influence of societal characteristics on all kinds of immigrant outcomes, is the study of van Tubergen, Maas, and Flap (2004). Instead of relying on observation of multiple-origin groups in a single destination or a single-origin group in multiple destinations, the authors proposed a combined method that allows a comparison of multiple origins in multiple destinations (as mentioned before, the so-called cross-classified multilevel approach). Since this design disentangles effects of characteristics of countries immigrants come from ('origin effects'), characteristics of the countries to which they migrate ('destination effects'), and characteristics of their specific community (the origin-destination combination), it is extremely useful for attempts to gain insights into immigrants' outcomes. Van Tubergen et al. focussed on the influence of origins, destinations, and communities on first generation immigrants' labour market participation and unemployment in 18 Western countries. Among others, results show that the longer left-wing parties have been part of a destination country's government, the more immigrants living in that country are active on the labour market and the more often they are employed; that immigrants originating from predominantly Christian countries participate more often on the labour market and are more often employed than immigrants from non-Christian countries (the employment of males being an exception); and that the more the economic development (measured as GDP per capita) of an immigrant community's country of origin differs from the economic development of its current country of destination, the less these members will be active on the labour market and the less they will be employed.

Fleischmann and Dronkers (2008) focussed on the labour market integration of first-*and* second generation immigrants living in 13 European Union member states. Using data from the second wave of the European Social Survey 2004/2005, they were able to analyze four instead of two indicators of labour market integration: labour market participation, unemployment, a white collar job (all three dichotomous), and job status. In addition to taking into account a wide range of social security and labour market policies of countries of

destination, they also considered the influence of characteristics of immigrants' countries of origin. Results show that male and female immigrants from countries with higher levels of political freedom have lower levels of labour market participation; the same goes for immigrant women originating from countries with higher levels of GDP per capita. Moreover, at the destination level, lower levels of unemployment among female immigrants are found in EU countries that have a social-democratic welfare regime and women living in countries that have a conservative regime generally have higher status jobs. Furthermore, one of the most important determinants of immigrants' labour market integration turned out to be the level of employment protection. Both male and female immigrants have lower status jobs in EU countries with high levels of employment protection. Analyses performed by Cohen and Kogan (2007) on the labour market performance and progress of immigrants from the former Soviet Union in Israel and Germany have revealed a related, though slightly different, finding. Immigrants entering the rigid German labour market (high levels of employment protection) suffer from high unemployment rates when they first arrive, but are more likely to attain high status jobs over time than their counterparts entering the more flexible Israelian labour market.

Instead of focussing on immigrants' labour market incorporation, van Tubergen and Kalmijn (2005) used a cross-classified design in order to explain differences in immigrants' (self-reported) command of their destination country's language. They pooled and standardized 19 existing surveys on immigrants in 9 Western countries, yielding a total of about 180.000 immigrants originating from 182 countries. Among others, results at the destination level show that both a left-wing government legacy and a high degree of prejudice towards immigrants have a negative influence on immigrants' destination-language proficiency. Moreover, it is illustrated that whereas immigrants originating from politically suppressed societies have a poorer command of the destination language, immigrants from non-Christian societies have better language skills.

André, Dronkers, and Fleischmann (in press) focussed on yet another immigrant outcome. They analyzed the degree to which 7034 first and second generation immigrants in 14 European Union countries feel discriminated. In line with Fleischmann and Dronkers (2008), they took into account a wide range of social security and labour market policies and other general societal characteristics. Their study reveals that no differences in perceived discrimination exist between the EU countries (no destination level variance), but that immigrants originating from different countries (irrespective of their country of destination) substantially differ in their feelings of being discriminated. Among others, immigrants from higher developed countries (HDI-index) feel less discriminated. An interesting finding is the higher level of discrimination immigrants from Islamic countries perceive, even regardless of their own religious affiliation. So, not only (especially) second generation immigrants with an Islamic religion feel more discriminated, but even non-Islamic immigrants originating from an Islamic country do so.

Levels et al. (2008) was the first study to take into account economic, social, and cultural macro-variables of both countries of origin and destination in order to explain differences in educational achievement between immigrants. Like the above listed studies, their study took into account variables such as left-wing government influence, level of political stability, and GDP per capita, however, this time applied to immigrants' mathematical literacy. Using data from the PISA 2003 survey, results show that the level of economic development (GDP per capita) of countries of origin negatively affects performance, that immigrants originating from more politically stable countries perform better at school, and that relative community size negatively affects achievement. Moreover, the higher educational performance of immigrant children living in traditional immigration societies can be fully explained by their favourable socio-economic background composition.

Countries' educational systems

Despite researchers' growing tendency to study immigrants' (educational) integration from a (cross-classified) macro-level perspective, they have hardly paid attention to the influence countries' educational systems might have. Studies that did analyze the influence of educational system features on the educational achievement of immigrant pupils are not only scarce, but have also been focussed on a very limited number of educational system features. For instance, the OECD (2007) study showed that the more differentiated a country's educational system, the more native pupils outperform immigrant pupils, even after taking into account social background characteristics. Ammermüller (2005), who used a more restricted measurement of differentiation (number of school types available), reached a more nuanced conclusion. The more different school types immigrant students can choose from in secondary education, the better they perform on average. However, for immigrant pupils who speak a foreign language at home, a diversified school system enhances the negative effect of speaking that language at home. Although these studies pay attention to the effects of educational systems on immigrants, immigrant status is just part of their analysis as a control variable, lacking a decent theoretical framework. Moreover, none of them has taken into account the variance in origins of first and second generation immigrants.[2]

Recognizing this gap in sociological research, de Heus et al. (in press) took into account a wide range of educational system features of both countries of origin and destination in order to explain differences in scientific achievement between immigrants. Despite the wide range of individual- and macro-level determinants Levels et al. (2008) took into account, substantial unexplained variance in immigrants' educational achievement remained on destination-, origin-, community-, and individual-level. De Heus et al. (in press) aimed to find out to what degree this unexplained variance can be attributed to educational systems' availability of resources and levels of differentiation and standardization. Using data from the 2006 PISA survey, they performed cross-classified multilevel analysis on the science performance of 9414 15-year-old immigrant children, originating from 46 different countries, living in 16 countries of destination. Results show that differences in scientific literacy between immigrants are not only affected by educational system characteristics of countries of destination, but also by educational system characteristics of their countries of origin. Almost 20 per cent of all variance in the educational achievement of immigrant pupils is at the origin level,[3] underscoring the necessity of taking into account immigrants' origins. At the origin level, the number of years of compulsory education positively affects the educational achievement of first generation immigrant children. At the destination level, the tracking of pupils' achievement data over time, higher government expenditure on education (only for second generation immigrants), and a higher pupil-teacher ratio has a positive influence on immigrants' educational achievement.

The two lines of research combined

After this short overview of the two lines of research on immigrants' educational achievement, it should be mentioned that the aim of this study is two-fold. First, it builds upon Levels et al. (2008) in not only taking into account a wider range of general social, economic, and cultural features of countries, but also considering policy related characteristics as described by Fleischmann and Dronkers (2008) and André et al. (in press). Second, these societal features and the significant educational system features illustrated by de Heus et al. (in press) will be analyzed simultaneously in order to find out what matters most for immigrants' achievement: education or society. So, the two research questions we are attempting to answer are: *1. To what extent can differences in immigrants' educational achievement be explained by countries' policies and by their general features (social,*

cultural, and economic)? 2. What matters most for immigrants' educational achievement: features of educational systems, or other societal features (policies; social, cultural, economic features)?

Figure 1 about here

Why countries' immigrant policies and other macro-characteristics might matter

In line with the above described studies, we expect several social, cultural, and economic characteristics of countries of origin and destination to influence immigrants' scientific literacy.[4] First, at the destination level, *we expect immigrant children living in traditional immigrant receiving countries to outperform immigrant children in non-traditional immigration countries (hypothesis 1).* This effect is expected to supersede the effect of composition (traditional immigration countries' policies encourage the selection of highly skilled immigrants; Borjas, 2001), since these countries have organized their educational systems in such a way that they can cope with the specific educational needs of immigrant children (Iredale and Fox, 1997). Second, since left-wing governments are more likely to adopt legislation intended to counter discrimination of minorities, it is expected that *immigrant children living in countries with a longer history of left-wing government will perform better at school (hypothesis 2).*[5]

At the origin level, *we expect immigrants originating from less (economically) developed countries to have higher levels of scientific literacy than their counterparts from more (economically) developed countries (hypothesis 3).* According to Feliciano (2005), this can be explained by the process of selective migration. Immigrants originating from less developed countries are generally highly selected immigrants who put more pressure on their children to perform well at school. We measure a country's level of development by its Human Development Index (HDI), its net migration rate, and its GDP per capita. Moreover, since immigrants originating from less politically stable countries are likely to have been pushed away by threatening events, the trauma of this migration process might translate into *lower performance of immigrant children from less politically stable countries (hypothesis 4).*[6] Next to using the Kaufmann's indicator of political stability, we also take into account an index of political freedom and civil rights to determine a country's level of political stability. Moreover, an origin country's prevalent religion can be regarded as a measure of the cultural distance between that particular country of origin and countries of destination (van Tubergen et al., 2004; Fleischmann and Dronkers, 2008). A greater cultural distance between immigrants and natives might not only foster discrimination on the labour market, but also in the educational system. Since all countries of destination analyzed in this paper are predominantly Christian, *we expect immigrant children originating from Christian origin countries to outperform immigrant children from countries with other prevailing religions (hypothesis 5).*[7]

At both the origin and destination level, we take into account the degree to which countries are individual- or collective- oriented. Whereas individual-oriented societies emphasize the worth and dignity of the individual, collective-oriented societies encourage people to put the interest of the group above their own (Hofstede, 1984; Ferraro, 2006). In individual-oriented societies, education is seen as the ultimate means to maximize human potential and reach personal goals and educational failure is seen as a personal deficit to reach these goals. Since collective-societies have a much stronger sense of responsibility to the group (e.g. the family, country, immigrant community), educational failure is not so much seen as personal failure, but rather as letting down the entire group. So although both types of cultures highly value education, the reasons differ. Since this is the first study to relate these

countries' different cultural orientations to actual educational achievement of immigrants, it is difficult to state whether either the desire for personal growth or the sense of loyalty to the group places a higher emphasis upon good educational achievement, resulting in the following bi-directional hypothesis: *the higher the level of individualization of immigrants' countries of origin/destination, the higher or lower their educational performance will be (hypothesis 6).*

Origin and destination countries not only differ on all kinds of cultural, economic, and religious dimensions, but also on their immigrant policies. The different political approaches towards immigration are often seen as an important determinant of differences in cross-national immigrant integration (Koopmans, 2002). Our general line of reasoning applied to the following hypotheses is that policies that encourage immigrant parents' integration positively influence the educational achievement of immigrant children in a country, even after controlling for their parents' socio-economic capital. After all, immigrant policies convey a country's view on immigrants and immigration that is likely to influence immigrants' educational motivation and success even irrespective of their parents' economic and cultural status.

First, the Migrant Integration Policy Index (MIPEX) takes into account over a hundred policy indicators in order to determine to what extent immigrants living in a European Union member state profit from policies on long-term residence, access to nationality, anti-discrimination, family reunion, political participation, and labour market access (Niessen, Huddleston, and Citron, 2007). Since countries that score high on these policy dimensions are expected to have a positive influence on their immigrant population's economic, political, and social integration, immigrant children's educational achievement is likely to profit as well. After all, seeing their parents profit from these policies might provide them with an incentive to perform well at school. Since countries with favourable immigrant policies 'reward' good performance with assets such as high-quality jobs, performing well at school actually pays off. So, *we expect higher levels of educational performance of immigrant children living in countries that have more favourable immigrant policies (hypothesis 7).*

Second, related to the degree to which countries' policies support immigrants' labour market access is the flexibility of the labour market. It is argued that *immigrant children living in countries with flexible labour markets (lower levels of employment protection) outperform their immigrant counterparts in countries with more rigid labour markets (higher levels of employment protection) (hypothesis 8).* Since higher levels of employment protection increase the risk to employ immigrant workers (Cohen and Kogan, 2007), immigrant parents' socio-economic integration is hampered,[8] leading to less educationally motivated children.

Third and finally, in line with hypothesis 8, *we expect the educational achievements of immigrant children living in liberal welfare regimes to be higher than the achievements of immigrant children in other types of welfare regimes (hypothesis 9).* The liberal welfare regimes' combination of a relatively flexible and deregulated labour market and a market-based social security system with low benefits is likely to foster the social-economic integration of immigrants' parents (Kogan, 2007), again positively affecting their children's outlook on education. Next to the liberal welfare system, we distinguish the social-democratic, conservative, Mediterranean, and ex-communist welfare regime.[9]

Educational systems versus societal characteristics

Although the studies that have considered the effects of origin and destination countries' educational systems and other societal features have revealed interesting findings, society and its institutions are interrelated and should therefore be studied accordingly. One of the first sociologists to explicitly refer to the interrelatedness of different societal segments was Karl Marx. According to Marx, societies' economic structures determine other societal spheres

such as legal, political, and academic institutions. Although often debated (e.g. Max Weber argued that societies' religious bases influence their economic structures, instead of the other way around), Marx's line of reasoning nevertheless sheds an interesting light on the emergence and importance of modern educational systems. The industrialized economic structure of contemporary societies is meritocratic and impersonal and requires technical skills for many jobs. Such a society demands an educational system that provides extensive and prolonged education outside the home (Wallace and Wolf, 2006).

That societies' economic features are indeed related to educational system features is displayed in figure 2. As can be seen, an origin country's years of compulsory education is strongly related to its level of economic development (as measured by its GDP per capita). The same correlations have been found between other macro-characteristics such as an origin country's level of HDI and the years of compulsory education (figures not shown).

Figure 2 about here

Consequently, if the effects of educational systems as found by de Heus et al. (in press) are in reality (partly) reflections of other societal characteristics, these educational system effects might be (partly) spurious. That is, as stated under hypothesis 1 to 9, we expect societal policies and other societal characteristics to influence children's educational achievement, irrespective of educational system features. Moreover, a country's societal characteristics are likely to influence its educational system as well. After all, as mentioned before, it is not unlikely to expect more economic developed, industrialized societies to invest more in education through for example more years of compulsory education and higher levels of government expenditure. If this holds and certain societal characteristics indeed (directly) influence both educational system features and immigrants' educational achievement, the effects of educational systems might be (partly) spurious. This might even provide an explanation for the rather surprising finding that immigrant children's educational achievement profits from a higher pupil-teacher ratio in the children's destination countries. After all, a destination country's pupil-teacher ratio might in fact be a reflection of its level of economic development.[10] So, we state that *after taking into account societal characteristics as described under hypotheses 1 to 9, the effects of educational systems on immigrants' achievements will decrease or even turn out to be insignificant at both the origin and destination level (hypothesis 10).*

PISA 2006 and its focus on scientific literacy

Since 2000, the Organization for Economic Co-operation and Development (OECD) has tri-annually conducted large scale tests among 15-year-olds living in its member states and partner states in order to assess pupils' mathematical, reading, and scientific literacy. In doing so, the OECD has aimed to find out to which extent pupils near the end of compulsory education have acquired some of the knowledge and skills essential for full participation in society. Alongside information on pupils' educational performance, PISA also provides information on their individual characteristics (e.g. on parental education and careers, resources that are available in the child's home, the language spoken at home, the birth countries of both the parents and the student) and the school they attend (e.g. the teacher-student ratio, the number of vacant science positions, the school's location) through respectively administering a student and a principal questionnaire.

The dependent variable of this study is scientific literacy, which was the main focus of the PISA 2006 wave. In order to be able to cover as many facets from the scientific field as possible (in general, the scientific field should be regarded as a combination of the disciplines of Biology, Physics, Chemistry, and Geography, covering topics such as health, natural

resources, and environment), a test with a total assessment time of 390 minutes was developed. However, since it would not be sensible to administer a test of more than 6 hours to an individual pupil, 13 largely comparable item clusters (also called booklets) with a duration of 2 hours each were derived from the core test. These booklets were allocated to individual students according to a random selection process. Each participating student spent two hours carrying out pencil-and-paper tasks, of which approximately 54 per cent of the testing time was devoted to science, 31 per cent to mathematics, and 15 per cent to reading. The booklets contained tasks requiring students to construct their own answers as well as multiple-choice questions. However, since two booklets can never have exactly the same average difficulty, Item Response Modelling was used to establish comparable science results across students. Item Response Modelling involves the construction of several plausible science values for each student. So, instead of obtaining just one score to indicate each student's science ability, a range of 5 possible science score values per student was estimated.[11] Since the scale of these five plausible science values has a Cronbach's alpha of 0.987, the average of these 5 values is an unbiased estimation of a student's science performance, and will be used as the dependent variable of this study.[12]

Determining pupils' country of origin and immigrant status

Since specific information on the country of birth of both the parents and the student is necessary to be able to determine a pupil's country of origin, countries that did not allow enough specificity in birth countries could not be taken into account. Therefore, although no less than 57 countries participated in the 2006 PISA wave, only data from the following 16 developed countries are suited to test the hypotheses: Australia, Austria, Belgium, Denmark, Finland, Germany, Greece, Latvia, Liechtenstein, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Switzerland, and Scotland. Since the majority of European immigrants in the Netherlands originates from Germany, and the majority of non-European immigrants originates from Turkey (Garssen, Sprangers and Nicolaas, 2005; Garssen, Lalta and Portegijs, 2006), the Netherlands could be taken into account despite its relatively broad categories of 'born in the Netherlands', 'born in another European country', and 'born in another non-European country'.[13]

In order to determine pupils' country of origin, several decision rules have been used based upon their own birth country and the birth countries of both of their parents. Next to the pupil's country of origin, we identified his/her immigrant status. Students of whom at least one of the parents was born in a country different from the destination country were identified as immigrants. Immigrant students were either classified as first or second generation immigrants, with the former being those students who were born abroad themselves as well (table I.1., appendix, provides an elaborate overview of the decision rules applied). Finally, the decision rules used to identify pupils' country of origin and immigrant status amounted up to a final sample of 9414 immigrant students, originating from 46 different countries of origin.

Tables 1 and 2 about here

Independent variables at the individual-, community-, origin-, and destination-level

To answer this study's research questions, various data sources were used. At the destination level, a dummy was created to distinguish the *traditional immigration countries* Australia and New Zealand that have received large inflows of immigration from the 19th century onwards, from the European destination countries where immigration became important after World War II (Bauer et al, 2000). *Left-wing government presence* measures the degree to which left-

wing parties were present in government during the last thirty years. In line with Beck et al. (2001), a destination country received a score of 1 for each year that its government was fully made-up of left-wing parties; a score of 0.5 for presence of a left-wing party in a coalition with centre and/or right-wing parties; and a score of 0 to indicate a year without left-wing parties in government.

A more direct measure of destination countries' immigrant policies is *the Migrant Integration Policy Index (MIPEX)*, which displays on a scale from 0 to 100 to what degree a country's immigrant policies foster integration. Next to the overall score, we take into account the degree to which policies encourage integration in the sub areas of long-term residence, access to nationality, anti-discrimination policy, family reunion, political participation, and labour market access (all on a scale from 0 to 100). Whereas Portugal has the highest values on both the overall scale (79) and most of the subscales, Latvia's immigrant policies are the least in favour of immigrant integration (a score of 30 on the overall scale). Since the MIPEX does not take into account our destination countries New Zealand, Australia, and Liechtenstein, we decided to approach the scores for Liechtenstein by its surrounding countries Germany, Austria, and Switzerland. In case of New Zealand and Australia, we imputed the overall means of all 28 countries participating in the MIPEX.

The level of destination countries' labour market flexibility is measured by *the index of Employment Protection Legislation (EPL)*. In taking into account several employment protection policies, an overall EPL score per country is computed by the OECD. To increase the reliability of the country scores, we averaged the available EPL values of the years 1990, 1998, and 2003. Whereas Scotland (as a part of the United Kingdom) has the lowest level of employment protection with a score of 0.65, Greece's EPL value of 3.33 exceeds all other destination countries.

Last, at the destination level, we distinguished *different types of welfare regimes*. In line with Esping-Andersen's classic welfare regime typology, Australia, New-Zealand, and Scotland (UK) were labelled as liberal regimes; Austria, Belgium, Switzerland, Luxembourg, Liechtenstein, the Netherlands, and Germany were regarded as conservative regimes; the Scandinavian countries Denmark, Finland, and Norway make up the social-democratic group; Latvia is seen as an ex-communistic regime; and last, Portugal's and Greece's welfare regime got labelled 'Mediterranean'. Four dummy variables were computed and the liberal welfare regimes were used as reference category.[14]

At the origin level, a country's level of economic development was approached by its *Human Development Index (HDI)*, *Gross Domestic Product per capita (GDP),* and *net migration rate*. Whereas GDP per capita merely refers to a country's economic development level in taking into account the total amount of final goods and services (in US dollars) that are produced by a country in a year (CIA World Factbook, 2008), the HDI provides a broader picture of a county's human development level. Ranging from 0 to 1, the Human Development Index (2007/2008) combines information on countries' life expectancies, adult literacy rates, gross enrolment ratios in primary, secondary, and tertiary education, and GDPs in order to measure countries' levels of human development. Moreover, this study takes into account the net migration rates of all countries of origin. Since the net migration rate refers to a country's number of immigrants relative to its emigrants per thousand inhabitants, a negative rate is likely to refer to less developed origin countries. Overall, descriptive analyses reveal that the three indicators go hand in hand. Origin countries with higher levels of HDI also have higher scores on GDP per capita (correlation: 0.82), and both development measures are positively related to countries' net migration rates as well (correlations around 0.45).

Next, to measure origin countries' political situation, we used the *Kaufmann's indicator for political stability* and the two additional *indices of political freedom* and *civil*

rights. Ranging from -2.5 to 2.5 (standardized scores), the Kaufmann's indicator assesses the probability that an origin country's government in function will be overthrown in the near future by unconstitutional or violent means (Kaufmann, Kraay, and Mastruzzi, 2006). Higher scores refer to less chance of violence and therefore higher levels of political stability. The indices of political freedom and civil rights were derived from the United States' Freedom House that annually rates countries' political rights and civil liberties on a scale from 1 (most free) to 7 (least free).[15]. As a result of mirroring, high scores refer to countries with high levels of political freedom and civil rights.

To take into account *origin countries' religious backgrounds*, dummy variables were created to indicate whether or not at least fifty percent of the countries' inhabitants are Catholic (reference category),[16] Protestant, Christian (others),[17] Eastern Orthodox, Eastern religious, Islamic, or non-religious. Countries in which no religious denomination has the support of at least fifty percent of the population were classified as 'no prevailing religion'. In our analysis, the first four categories will be regarded as Christian origin countries.

Last, based on Geert Hofstede's individualism-collectivism dimension, all origin and destination countries were assigned a score to indicate their level of individualization. Whereas with a score of 14 Pakistan has a highly collectivistic culture, the United States' score of 91 underscores its highly individualized culture.

In addition to these origin and destination characteristics, we take into account a range of (common) individual and community features. Since these measures do not diverge from de Heus et al. (in press) and since the focus of our study lies elsewhere, we refer the reader to their study for a more elaborate description of these variables. Table 3 provides an overview of minimum and maximum scores, the mean, and the standard deviation of all variables in our analysis.

Table 3 about here

Multilevel Analysis

To analyze data in a double comparative design, multilevel techniques have to be used. By using individual-level techniques (such as OLS regression) on data with multiple levels, standard errors of the macro-level effects will be underestimated and consequently, parameters may unjustly appear to be significant (Raudenbush and Bryk, 2002; Snijders and Bosker, 1999). To analyze non-hierarchically structured data, cross-classified multilevel regression analyses are appropriate (Raudenbush and Bryk, 2002; Snijders and Bosker, 1999). We used Iterative Generalized Least Squares (IGLS) estimation techniques from the statistical analysis program MLwiN to estimate models (Browne, 2003). Although originally designed to fit hierarchical models, IGLS can also be adapted to non-hierarchical data structures. IGLS is based on an iterative procedure which provides point estimates for all parameters, including their standard deviations.

The influence of societies' policies and other societal features on scientific literacy

Table 4 is used to test our expectations on the influence of societies' policies and other societal features as stated under hypotheses 1 to 9. In order to rule out compositional differences between origin groups and destination countries, model 1 starts by adding individual level predictors to the initial empty model. Compositional effects occur whenever the composition of groups (e.g. schools, origin countries, destination countries) with respect to individual background variables is not identical for all groups (Hox, 2002). Considering these possible compositional effects is important since not doing so would overestimate the influence of countries' contextual features this study takes into account. By adding the individual-level variables, the total unexplained variance has been reduced by 20 per cent.

Most striking is the reduction in unexplained variance at the origin level: no less than 53 per cent of the initial variance in science performance between different origin groups can be explained by compositional differences. This reduction is largely caused by parental economic and socio-cultural capital. Apparently differences in average science performance between different origin groups are to a large extent caused by differences in average economic and socio-cultural background of these groups.

Model 2, 3, and 4 respectively add policies and other societal variables at the destination-, origin-, and community level (see table II.1. in the appendix for a stepwise addition of the macro-level variables to model 1 of table 4). Differences in scientific literacy between immigrants living in different countries can be completely explained by the destination countries' immigration history. As expected under hypothesis 1, immigrants living in the traditional immigration countries New Zealand and the United States outperform immigrants living in the other countries that have a less long history of immigration. As can be seen from the significant interaction between parental socio-economic status and traditional immigrant countries (model 6), this strong positive effect is strongest for children from high status families. For children from lower status families, there is no effect. Thus, unlike immigrant children from middle class and higher status families, immigrant children from lower class backgrounds living in traditional immigration countries do not outperform their counterparts in non-immigration countries. Moreover, destination countries that have a high scoring native population, generally also have a high scoring immigrant population (0.50). Destination countries' political climate, on the other hand, does not seem to influence immigrants' scientific achievement at all. Unlike as expected under hypothesis 2, immigrant children living in countries with a long history of left-wing oriented governments do not outperform immigrant children living in countries with more right-wing oriented governments. The same insignificant results were found for our more direct policy measures. Neither the components of the Migrant Integration Policy Index nor destination countries' labour market employment protection significantly affect immigrants' scholastic performance, thereby rejecting hypotheses 7 and 8. Last, although the stepwise addition of macro-level indicators to model 1 of table 4 seemed to lend support for hypothesis 9 which stated that immigrant children living in liberal welfare regimes would outperform their immigrant counterparts in other type of regimes, this finding was not upheld after controlling for traditional immigrant countries. That is, the positive effect found for liberal welfare regimes was in fact a reflection of those countries' immigration history.

At the origin level, the most important predictor of immigrants' achievements is their origin countries' dominant religion. In contrast to hypothesis 5 which stated that immigrant children from predominantly Christian countries perform better than their counterparts from other religious origins, results show that children originating from prevalently Catholic, Protestant, or Eastern Orthodox countries perform less than children originating from Eastern religious or non-religious countries, thereby rejecting hypothesis 5. The lowest performers (ceteris paribus) are the immigrant children from other Christian and Islamic countries (results of this additional test not shown). Strikingly, the negative effect of Islamic origin countries is strongest for children from the least affluent families (-31.54). Children from the highest class families originating from Islamic countries, on the other hand, do not perform less than their counterparts from other religious origin countries (-0.6). Origin countries' levels of economic development and political stability on the other hand do not significantly influence immigrants' performance. Unlike expected, lower levels of economic development of countries of origin do not positively affect immigrants' achievement (hypothesis 3) and immigrant children from politically stable origins do not outperform their counterparts from less stable origins (hypothesis 4). Last, the expected relationship between a country's level of individualization and immigrant performance has not been detected at both the origin and

destination level (hypothesis 6). Apparently different incentives to perform (personal goals versus family pride) do not lead to actual differences in educational achievement. Compared to the model with individual level variables only, the addition of significant origin level predictors (model 3) reduced the unexplained variance by no less than 56 per cent.

Table 4 about here

Can educational systems face up to societal features?

To test our second research question, we start by a stepwise addition of the significant societal features to the final model presented by de Heus et al. (in press). Their final model revealed significant effects of the following educational system characteristics: destination countries' degree of tracking of achievement data, destination countries' expenditures on education as percentage of total government expenditure (for second generation immigrants only), destination countries' pupil-teacher ratios, and origin countries' years of compulsory education.[18] In order to determine whether these results hold after controlling for several societal characteristics, characteristics of countries of destination are added in model 2, and characteristics of countries of origin are added in model 3 of table 5.

Table 5 about here

First, after taking into account destination countries' immigration history, the positive effect of tracking of achievement data turns insignificant. Since traditional immigrant countries in general spend a relatively high percentage of government money on education (13.3 per cent in case of Australia and 20.9 per cent in case of New Zealand) and since they are generally characterized by many schools tracking achievement data (87.9 per cent in Australia and 91.8 per cent in New Zealand), the initial relationship between tracking and immigrant achievement seems to be spurious. The positive effect of pupil-teacher ratio on educational achievement, on the other hand, is upheld even after taking into account the societal characteristics. The same goes for the positive effect governments' expenditure on education has on second generation immigrants' scientific literacy. Although insignificant for first generation immigrant pupils (1.15), it has a substantial positive influence on second generation immigrants (12.14). Second, after adding the significant religious denominations at the origin level, the years of compulsory education continue to have a positive effect on immigrants' scientific literacy. Since unlike expected features such as origin countries' levels of economic development and political stability do not significantly contribute to immigrants' achievement differences, these predictors are neither able to explain the significant effects of origin countries' compulsory years of education.

So, in sum, the results of the simultaneous analysis of societal features and educational system features only lend limited support for hypothesis 10. The support is limited since despite controlling for a wide range of societal features of countries of destination the positive effect of pupil-teacher ratio remains highly significant. That is to say, immigrant children living in countries that are on average characterized by many pupils per teacher outperform their immigrant counterparts in countries with a lower pupil-teacher ratio and this relationship cannot be explained by other societal features such as left-wing party presence or economic development. The same goes for the share of government money spent on education. Even after controlling for destination countries' economic level, policies, and other societal features, second generation immigrant children living in countries that spend a high percentage of government money on education still outperform their second generation counterparts in countries that invest less in their educational system. Moreover, the years of

compulsory education of immigrants' countries of origin continue to exert a significant positive influence.

Differential effects of immigrant generation and arrival age per destination country

Whereas the preceding analysis assumed the effects of our independent variables to be fixed across countries of origin and destination, table III.1. (appendix) presents the results for a random slope model. As can be seen from this table, most effects of immigrants' individual background variables do not differ between countries of origin and destination. That is, for example, immigrant pupils who speak the language of their country of destination outperform immigrant pupils who do not by on average 17 test points and this difference does not significantly vary across countries of origin or destination. Stated differently, the positive effect of speaking the host country's language is equally positive in all countries of destination and for immigrants from all origins. Exceptions are the differential effects of immigrant generation and arrival age across countries of destination.

In the case of immigrant generation, the positive effect of being a second generation immigrant that has been found across all immigrant pupils (7.82) strongly fluctuates between countries of destination ($7.82 \pm 2 * \sqrt{250.51} = [-23.84; 39.48]$). In Denmark, Germany, Greece, and Luxembourg, first generation immigrants significantly outperform their second generation counterparts. It is noteworthy that these are in general countries with the largest differences in scientific literacy between immigrants and natives (in Denmark, immigrants lack behind by no less than 113 points, in Germany, the difference is -93). In Austria, Belgium, the Netherlands, Finland, Norway, New Zealand, and Latvia, first and second generation immigrant children do not differ significantly in scientific skills.[19] The fixed coefficient therefore clearly hides the finding that in many destination countries second generation immigrants do not significantly outperform first generation immigrants at all and thereby underscores the additional value of a random slope model.

In the case of arrival age, effects differ substantially between destinations as well. Ranging from -6.96 to 1.78 ($-2.59 \pm 2 * \sqrt{4.77}$), a higher migration age is negatively, and in some destination countries even positively, related to educational achievement. For none of the individual variables significant covariances have been detected, implying that origin or destination countries' average science performance (intercept) is not related to the strength of their individual level effects (slopes), and thus cannot be explained by artificial ceiling or bottom effects.

Conclusion and discussion

Over the last decades, more and more cross-national survey data sets including more and more countries have become available to researchers. Cross-national data sets that have given rise to studies on educational attainment across countries are for example the IEA-studies (implemented in the late 1960s), TIMMS, PISA, and PIRLS. In providing information on populations' actual scholastic achievement, the results of these studies are often regarded as a direct reflection of educational systems' functioning. Thus, more than ever before, educational systems abroad have become an important point of reference for national education policies (Schneider and Kogan, 2008). However, if countries are to successfully learn from and adopt each other's educational system features, two important matters that have been largely absent in both the political and scientific debate should be acknowledged. First, immigrant pupils differ from native pupils in their socio-economic and specific immigrant backgrounds (OECD, 2007) and might therefore profit from different educational system features than native pupils. Second, individual pupils' educational achievement is influenced by numerous (multilevel) factors such as their family characteristics, the schools they attend, and their educational system's features (Wößmann, 2003; Hanushek and

Wößmann, 2005; OECD, 2007; Dronkers and Robert, 2008). For immigrant pupils, this web of influence is even more complex. Not only is their educational achievement influenced by features of their countries of destination, their countries of origin also continue to have a significant influence (Levels et al., 2008; de Heus et al., in press). The two research questions this study aimed to answer are directly linked to these matters. We conducted cross-classified multilevel analysis on PISA 2006 data concerning 9414 immigrant pupils, originating from 46 countries of origin, living in 16 countries of destination in order to establish which individual-, community-, and macro-level features affect immigrant children's performance.

To begin with, our analysis has revealed that destination countries' (immigration) policies cannot explain differences in immigrants' educational achievement. The degree to which countries encourage immigrants' integration through supporting among others political participation, labour market access, and long term residence is unrelated to immigrant children's educational performance. A plausible explanation might be that since these policy measures are directed towards immigrant children's parents, (part of) their influence is captured in the individual parental characteristics of immigrant children (ESCS). Additional analyses (not shown) indeed suggest that this is the case for destination countries' levels of employment protection. After omitting the parental background variable, countries' levels of employment protection indeed have the expected significant negative effect on immigrant children's performance. This is not the case for the Migrant Integration Policy Index (MIPEX) measures. Although this lacking policy influence might seem surprising, earlier studies have revealed that the influence of policy indicators on immigrants' labour market integration is meagre at best as well. Next to the finding that male immigrants' labour market participation profits from higher chances to adopt the destination country's nationality, no significant effects of countries' policies on immigrant outcomes have been detected (Fleischmann and Dronkers, 2008). This possibly hints at a gap between countries' intended policies and their actual implementation.

With regard to destination countries' other societal features, countries' immigration histories seem to be the most important determinant of their immigrants' scholastic success. Although traditional immigration countries such as Australia and New Zealand generally attract the higher selected immigrants with more favourable backgrounds, immigrant children living in these two countries would still outperform their immigrant counterparts in other countries if they would not differ on individual background composition. Authors suggest that this advantage stems from traditional immigration countries' merits, such as a more favourable view of non-immigrants toward immigrants' contribution to the economy (Bauer et al, 2000), and an educational system that is better able to cope with the specific educational needs of immigrant children (Iredale and Fox, 1997). However, our finding that lower status immigrant pupils living in traditional immigration countries do not outperform their counterparts in non-traditional immigration countries suggests that these merits are not effective for lower class immigrants. A reason might be that because of the historical selection of and focus on prosperous immigrants, these countries are less to support the few lower status immigrants they attract. However, since this study was merely able to take into account two traditional immigration countries, it is difficult to state which contextual features it is exactly that influence immigrants' achievement in these countries. Future research is necessary to fully grasp what it is exactly that makes higher status immigrants gain, and lower status immigrants loose in the traditional immigration countries.

At the origin level, strong effects were found for countries' prevailing religions. Unlike expected, everything else being equal, immigrant children originating from Catholic, Protestant or other Christian countries are not the highest performers. Instead, immigrant children from non-religious countries and eastern religious countries have the highest scientific literacy. Interesting is the strong negative effect Islamic countries seem to exert:

immigrant pupils from those countries (and from the Christian countries) perform worse than immigrant children from all other religious origins. Since PISA does not allow determining immigrant pupils' individual religious affiliation, though, it is not possible to state whether this effect is (mainly) due to contextual features of the Islamic countries or rather due to the individual religious views of the children originating from them. If the former is the case, even children who do not adhere to the Islamic religion themselves but nevertheless originate from an Islamic country experience negative scholastic effects. Three plausible explanations might clarify this. First, the lower performance of pupils originating from Islamic countries might be a result of feelings of subjective discrimination these pupils experience (André et al., 2008). Second, the negative selective migration of immigrants originating from the Islamic countries might explain their children's scholastic disadvantage. From the 1960s on, a number of European countries (e.g. Belgium, Germany, the Netherlands) started to recruit 'guest workers' from the three Islamic countries Morocco, Algiers, and Turkey. The selection of these 'guest workers' deviated from other immigrants from most other regions: they originated from the poorest and most backward regions of these countries and were transported 'on a temporary basis'. The relatively low level of parental resources (relative to the remaining population) these 'guest workers' can provide their children with, might explain the relatively low educational achievement of immigrant children originating from the Islamic countries. Our finding that especially lower class children from Islamic countries lack behind lends some support for this guest worker explanation. After all, these lower class children are more likely to originate from guest worker families than their higher class counterparts. As pointed out by Feliciano (2005), the guest workers' relatively low (educational and financial) resources (compared to the remaining population) might explain the lower achievement of their children, even on top of their absolute socio-economic and cultural capital (escs). [20] These first two explanations hold for children originating from Islamic countries, irrespective of their individual religious affiliation. Third, the Islamic religion promotes a different religious *habitus* that makes adherents less likely to succeed in education. That is, if for instance one of their religious values (honour) partly contradicts one of the conditions for success in modern societies (productivity and efficiency), Islamic immigrants' educational success might suffer. Taken into account the sensitive but nevertheless extremely relevant nature of our finding, future research is necessary to further address the influence of countries' and individuals' religious views on actual educational performance.

Although strong effects have been found for destination countries' immigration histories and origin countries' prevalent religions, most educational system features nevertheless have remained significant. At the destination level, higher pupil-teacher ratios and a higher percentage of government expenditure invested in education are related to higher immigrant performance (in the case of expenditure, this positive effect only exists for second generation immigrants) and at the origin level, the years of compulsory education positively affect performance. The initial positive effect of the tracking of pupils' achievement data at the destination level, however, turned insignificant after controlling for destination countries' immigration histories. Therefore, contrary to our expectations (more elaborately described in de Heus et al., in press) that a higher amount of human resources positively affects immigrants' educational achievement, more students per teacher seem to improve immigrants' achievement. In light of current political debates as whether or not to reduce average class sizes, three important remarks have to be made with regard to this finding. First, a possible explanation of this unexpected result might be that immigrant pupils sit more often in classes, where the ethnic density (the share of immigrant pupils with the same background within a class) is higher. Previous studies show that immigrant pupils perform better in classes with a higher ethnic density (Peetsma, Veen, Koopman and Schooten, 2006). Since

larger classes have a higher probability of high shares of immigrant pupils with a common background, they have a higher chance of having better performing immigrant pupils. Second, a country's average pupil-teacher ratio should not be confused with its average class size. Unlike computing average class sizes by computing the ratio between the number of teachers and students in a school or country, calculating the pupil-teacher ratio also requires taking into account educational staff that is not in the classroom most of the time (e.g. principals, counsellors, music teachers, teaching assistants). So, in general, average class sizes tend to be larger than the measured pupil-teacher ratio (Achilles). If now some countries have more supporting educational staff relative to others, the effects of average pupil-teacher ratio and average class sizes of countries of destination do not have to be the same at all. Third, it has to be borne in mind that our analyses have been conducted at the country-level, which is something fundamentally different than analyses at the school-level. After all, measures at the country-level conceal information on the pupil-teacher ratio's of the schools immigrants attend. Implementing macro-level conclusions at the school-level would lead to the well-known ecological fallacy.

The results of this study underscore the importance of the two matters addressed at the beginning of this conclusion section. National governments' policies directed towards improving pupils' educational attainment should be aware of their ever growing immigrant shares. As the results of this study and earlier studies show, immigrants' educational achievements are being influenced by numerous factors. Although most important are their individual characteristics (74 per cent of all initial variance is at the individual level), immigrants are also influenced by the immigration histories, pupil-teacher ratios, and government expenditures on education in the countries they move to, and by the religious views and years of compulsory education in the countries they originate from. Sloppy thinking about for example adopting the Finnish comprehensive school system as a result of the high scoring Finnish pupils (PISA 2000, 2003, and 2006),[21] should therefore be avoided. After all, not only do immigrant children not profit from less different school types in secondary education at all (de Heus et al., in press), results of this study also show that the influence of educational systems on immigrant performance is rather limited. So, can educational systems compensate for societal features? Only to a very limited extent. Individual backgrounds such as parental capital and societal characteristics such as religious origins and destination countries' immigration histories have a much larger influence on educational performance. Governments should establish which factors cause certain (both immigrant and native) populations to outperform their own before immediately attributing performance differences to differences in educational system features.

Literature

Achilles, C.M. *The Difference Between Class Size and Pupil/Teacher Ratio*. Available from: www.heros-inc.org/pupil-teacher%20ratio.pdf (last access 19 May 2008).

Ammermüller, A. (2005). Educational Opportunities and the Role of Institutions. *ZEW Discussion Paper No. 05-44.*

André, S., Dronkers, J., and Fleischmann, F. (in press). *The Different Levels of Discrimination, Experienced by First and Second Generation Immigrants from Different Countries of Origin in the Different EU Member-states.* Paper presented at the Research Committee 28, Florence, 15-17 May 2008 and the Dutch-Fleming Meeting of Sociology 2008, Leuven, Belgium, 29 May 2008. http://www.eui.eu/Personal/Dronkers/English/Andre.pdf

Arts, W.A. and Gelissen, J. (2002). Three Worlds of Welfare Capitalism or More? A State-of-the-art Report. *Journal of European Social Policy, 12*, 2, 137-158.

Bankston, C. L. and Min Zhou (2002). Being Well vs. Doing Well: Self-Esteem and School Performance among Immigrant and Non-immigrant Racial and Ethnic Groups. *International Migration Review, 36*, 2, 389-415.

Bauer, T. K., Lofstrom, M., and Zimmermann, K.F. (2000). Immigration Policy, Assimilation of Immigrants and Natives' Sentiments towards Immigrants: Evidence from 12 OECD-Countries. *Swedish Economic Policy Review, 7*, 2, 11-53.

Beck, T., Clarke, G., Groff, A., Keefer, P., and Walsh, P. (2001). New Tools in Comparative Political Economy: The Database of Political Institutions. *World Bank Economic Review, 15,* 1, 165-176.

Borjas, G.J. (2001). Immigration Policy: A Proposal. Pp. 17–20 in *Blueprints for an Ideal Legal Immigration Policy,* edited by R. D. Lamm and A. Simpson. Washington, DC: Centre for Immigration Studies.

Browne, W. (2003). *MCMC Estimation in MLwiN*. London: Centre for Multilevel Modelling.

Castles, F.G. and Mitchell, D. (1993). Worlds of Welfare and Families of Nations, in *Families of Nations: Patterns of Public Policy in Western Democracies,* edited by F.G. Castles. Aldershot: Dartmouth Publishing Company.

Chiswick, B.R., and Miller, P.W. (1996). Ethnic Networks and Language Proficiency among Immigrants. *Journal of Population Studies, 9,* 19-35.

Chiswick, B.R., and Miller, P.W. (2002). Immigrant Earnings: Language Skills, Linguistic Concentration, and the Business Cycle. *Journal of Population Economics, 15,* 31-57.

Central Intelligence Agency. (2008). *The 2008 World Factbook.* Available from: https://www.cia.gov/library/publications/the-world-factbook/ (last access 25 May 2008).

Cohen, Y. and Kogan, I. (2007). Next Year in Jerusalem … or in Cologne? Labour Market Integration of Jewish Immigrants from the Former Soviet Union in Israel and Germany in the 1990s. *European Sociological Review, 23,* 2, 155-168.

De Heus, M., Dronkers, J., and Levels, M. (in press). *Educational Systems as a Resource or Hindrance for Immigrants? The Effects of Educational System Characteristics of Both Countries of Origin and Destination on the Scientific Literacy of Immigrant Children in Western Countries.* Paper presented at the Research Committee 28, Florence, 15-17 May 2008 and the Dutch-Fleming Meeting of Sociology 2008, Leuven, Belgium, 29 May 2008. http://www.eui.eu/Personal/Dronkers/English/Heus.pdf

Dronkers, J. and Robert, P. (2008). Differences in Scholastic Achievement of Public, Private Government-Dependent, and Private Independent Schools. *Educational Policy*, in press.

Esping-Anderson, G. (1990). *Three worlds of welfare capitalism.* Cambridge: Polity press.

Feliciano, C. (2005). Educational Selectivity in U.S. Immigration: How do Immigrants Compare to Those Left Behind? *Demography, 42,* 1, 131-152.

Ferraro, G.P. (2006). *The Cultural Dimension of International Business.* New Jersey: Pearson, Prentice Hall.

Fleischmann, F. and Dronkers, J. (2008). De Social-economische Integratie van Immigranten in de EU. Een Analyze van de Effecten van Bestemmings- en herkomstlanden op de Eerste en Tweede Generatie. [The Socio-economic Integration of Immigrants in the EU. An Analysis of the Effects of Countries of Destination- and origin on First and Second Generation] *Sociologie, 4,* 2-37.

Garssen, M.J., Lalta, V., and Portegijs, W. (2006). Bevolking. In: *Emancipatiemonitor 2006* (pp 16-37). 's Gravenhage: Sociaal en Cultureel Planbureau.

Garssen M.J., A.H. Sprangers, and Nicolaas, H. (2005). Demografie van de allochtonen in Nederland. In: Handboek Interculturele Zorg (p. I 1.3-1-74). Maarsen: Elsevier Bedrijfs informatie.

Hanushek, E.A. and Wössmann, L. (2005). Does Educational Tracking Affect Performance and Inequality? Differences-in-Differences Evidence Across Countries. *Economic Journal, 116,* C63-C76.

Hofstede, G. (1984). *Culture's Consequences: International Differences in Work Related Values.* Thousand Oaks, CA: Sage Publications, Inc.

Hox, J. (2002). *Multivariate Analysis. Techniques and Applications.* Mahwah (NJ)/ London: Lawrence Erlbaum.

Iredale, R. and Fox, C. (1997). The Impact of Immigration on School Education in New South Wales, Australia. *International Migration Review, 31*, 3, 0655-0669.

Kaufmann, D., Kraay, A. and Mastruzzi, M. (2006). Governance Matters V: Aggregate and Individual Governance Indicators for 1996-2005**.** *World Bank Policy Research Working Paper 4012.*

Kogan, I. (2007). *Working through Barriers: Host Countries Institutions and Immigrant Labour Market Performance in Europe.* Dordrecht, the Netherlands: Springer.

Koopmans, R. (2002). Zachte Heelmeesters… Een Vergelijking van het Nederlandse en het Duitse Integratiebeleid en wat de WRR daaruit niet concludeert. *Migrantenstudies, 18,* 2, 87-92.

Levels, M. and Dronkers, J. (2008). Educational performance of native and immigrant children from various countries of origin. *Ethnic and Racial Studies, in press.*

Levels, M., Dronkers, J., and Kraaykamp, G. (2008). Educational Achievement of Immigrants in Western Countries: Origin, Destination, and Community Effects on Mathematical Performance. *American Sociological Review, 73,*

Niessen, J., Huddleston, T. and Citron, L. (2007). *Migrant Integration Policy Index.* Available from: http://www.britishcouncil.org/netherlands-networks-mipex-report.pdf (last access 22 May 2008).

Organisation for Economic Co-operation and Development (2006). *Where Immigrant Students Succeed. A Comparative Review of Performance and Engagement in PISA 2003.* Paris: Organisation for Economic Co-operation and Development.

Organisation for Economic Co-operation and Development (2007). *PISA 2006 Science Competencies for Tomorrow's World. Analysis.* Paris: Organisation for Economic Co-operation and Development.

Peetsma, T., I. van der Veen, P. Koopman and E. van Schooten, 2006. "Class Composition Influences on Pupils' Cognitive Development." *School Effectiveness and School Improvement* 17:275-302.

Ramakrishnan, S. K. (2004). Second-generation immigrants? The '2.5 generation' in the United States. *Social Science Quarterly, 85*, 2, 380-399.

Raudenbush, Stephen W. and Anthony S. Bryk (2002). *Hierarchical Linear Models: Applications and Data Analysis Methods* (2nd edition). Newbury Park CA: Sage.

Schneider, S.L. and Kogan, I. (2008). The International Standard Classification of Education 1997: Challenges in the Application to National Data and the Implementation in Cross-national Surveys, 13-46, in *The International Standard Classification of Education (ISCED-97). An Evaluation of Content and Criterion Validity for 15 European Countries,* edited by S.L. Schneider. Mannheimer Zentrum für Europäische Sozialforschung.

Siaroff, A. (1994). Work, Welfare, and Gender Equality: a New Typology, 82-100, in *Gendering Welfare States*, edited by D. Sainsbury. London: Sage.

Snijders, T.A.B. and Bosker, R.J. (1999). *Multilevel Analysis. An Introduction to Basic and Advanced Multilevel Modeling*. London: Sage.

United Nations Educational, Scientific, and Cultural Organization (2007). World Data on Education, Geneva: UNESCO-IBE. Available from: http://www.ibe.unesco.org/countries/WDE/2006/index.html (last access 22 May 2008).

Van Tubergen, F. and Kalmijn, M. (2005). Destination-Language Proficiency in Cross-National Perspective: A Study of Immigrant Groups in Nine Western Countries. *The American Journal of Sociology, 110,* 1412-1457.

Van Tubergen, F., Maas, I, and Flap, H. (2004). The Economic Incorporation of Immigrants in 18 Western Societies: Origin, Destination, and Community Effects. *American Sociological Review*, 69, 704-727.

Wallace, R.A. and Wolf, A. (2006). *Contemporary Sociological Theory. Expanding the Classical Tradition.* New Jersey: Pearson, Prentice Hall.

Wößmann, L. (2003). Central exit exams and student achievement: International evidence. In M. West and P. Peterson (Eds.), *No Child Left Behind? The politics and practice of school accountability* (pp. 292-323). Washington, DC: Brookings Institution Press.

Notes

[1] Manon de Heus is a master's student of sociology at Tilburg University (the Netherlands). Jaap Dronkers holds a chair in the study of social stratification and inequality in the Department of Social and Political Sciences at the European University Institute near Florence (Italy). This paper is a product forthcoming from a traineeship of Manon de Heus at the European University Institute supervised by Jaap Dronkers. All correspondence to Jaap Dronkers, SPS Department, EUI, Via dei Roccettini 9, I-50014 San Domenico di Fiesole (FI), Italy. E-mail: jaap.dronkers@eui.eu

[2] This is a major drawback since the most recent PISA data once more reveal that in the great majority of participating PISA 2006 countries, immigrant students perform significantly less than their native counterparts. Even after controlling for the composition of immigrant populations in terms of their educational and socio-economic background, immigrants perform on average 34 score points below the native pupils (OECD, 2007). Next to differences in achievement between native and immigrant pupils, there are substantial achievement differences between different immigrant groups as well. In comparison to comparable native students and immigrant students from other origins, immigrant students originating from Western Europe, Western Asia, Northern Africa, and Latin America show substantially lower mathematics achievement, also after controlling for a wide range of individual characteristics (Levels and Dronkers, 2008).

[3] This study has even shown that there is three times more variance at the origin- than at the destination-level (6%). The remaining variance is at the individual level.

[4] We refer the reader to Levels et al. (2008) for a more elaborate description of the theoretical mechanisms.

[5] However, as correctly recognized by Fleischmann and Dronkers (2008), the inclusion of actual policy indicators reduces the extra value of this measure and it is mainly taken into account to connect to former research.

[6] A finding that relates to this expected relationship is that natives in countries that receive a lot of political refugees tend to be relatively concerned about immigration's impact on social issues such as crime (Bauer, Lofstrom, and Zimmerman, 2000). Although de facto this refers to a destination effect, it nevertheless implies a discriminative attitude towards political refugees that might translate into lower educational achievements of children originating from these countries.

[7] Unlike the European Social Survey, PISA does not ask pupils or parents for their individual religious affiliation. Therefore, conclusions about countries' dominant religions should not be translated to individual religions (the ecological fallacy).

[8] As mentioned before, Fleischmann and Dronkers (2008) have shown that immigrants have lower status jobs in EU countries with high levels of employment protection.

[9] Since welfare regimes differ on numerous dimensions and since it is rather a combination of these dimensions than one single characteristic/measure that determines immigrants' educational success, it is difficult to rank them. However, if the argument used under hypothesis 8 is applied, we should expect immigrants in the flexible liberal labour markets to outperform immigrants in the much more rigid Mediterranean labour markets. We refer the reader to Esping-Andersen (1990) and Kogan (2007) for a more elaborate description of the different characteristics of the welfare states we distinguish.

[10] If indeed countries' levels of economic development influence their educational system characteristics, the expected negative effect of economic development (hypothesis 3) might not hold. After all, given the positive effects of compulsory education, tracking of achievement data, and expenditure on education (de Heus et al, 2008), and the probable positive effect of economic development on these educational features, the effect of a country's economic development on educational achievement should be positive.

[11] Students also received 5 plausible values for each of the scientific competences 'identifying scientific issues', 'explaining phenomena scientifically', and 'using scientific evidence'. However, this study only takes into account the overall science performance.

[12] As recommended by the OECD (2007) and Hox (2002), we initially created a measurement model below the student-level. In taking into account the error term of a student's plausible values, this model provides a more reliable estimation of a student's true science score. However, due to the complex cross-classified nature of our analysis, MLwiN was unable to convert if we added the error terms as lowest level. However, since the Cronbach's alpha of the five plausible values is extremely high, we are convinced that the parameters of our equations are unbiased.

[13] Additional analyses that did not take into account the Netherlands have revealed highly similar results. None of the significant variables shown in table 5 (to be discussed later) turned insignificant after omitting the Netherlands from the analysis. The second largest non-Western immigrant group in the Netherlands are the Moroccans. Taken into account that their educational achievement is very similar to the Turkish immigrants' achievements (scores of 438 and 429 respectively; table 2), and that other Western immigrant groups living in the Netherlands come rather close to the German scores (a score of 528 for the Belgian immigrants, versus a score of 526 for the German immigrants), this is not a very surprising finding. The most important distinction to

be made with regard to immigrants living in the Netherlands is the distinction between non-Western and Western immigrant groups.

[14] However, this classification is debatable. Arts and Gelissen (2002) nicely show how different theoretical and empirical arguments have lead to seven different typologies. Whereas for example the majority of typologies classifies Australia and New Zealand as liberal welfare regimes (Esping-Andersen, 1990; Siaroff, 1994), Castles and Mitchell (1993) regard them both as radical welfare types.

[15] The correlation between the two Freedom House indices is no less than 0.97. However, since in our bivariate addition of macro-level variables (see table II.1.) both variables had insignificant results, no additional measures were necessary to prevent multicollinearity.

[16] Countries belonging to this category are among others Austria, Australia, Belgium, Germany, France, and Portugal.

[17] This category also takes into account the share of protestant and catholic people. However, countries belonging to this category do not have a protestant or catholic portion of more than fifty per cent.

[18] Since PISA does not contain information on the educational systems of a large part of the origin countries this study and de Heus et al.'s study (2008) distinguish, the sixth edition (2006/2007) of the *World Data on Education* (WDE) was used to derive information on these last three indicators. Initiated by UNESCO, it contains the profiles of the educational systems of 161 UNESCO member states, focusing in particular on official school curricula and curricular structures at the primary and secondary education levels (UNESCO, 2007).

[19] Since MLwiN does not allow determining empirical bayes estimates for an independent variable (immigrant generation) per group (country of destination) *controlled for other independent variables in the analysis,* additional spss-analyses were used to determine the influence of immigrant generation per country of destination (controlled for all other individual variables). Results are not shown.

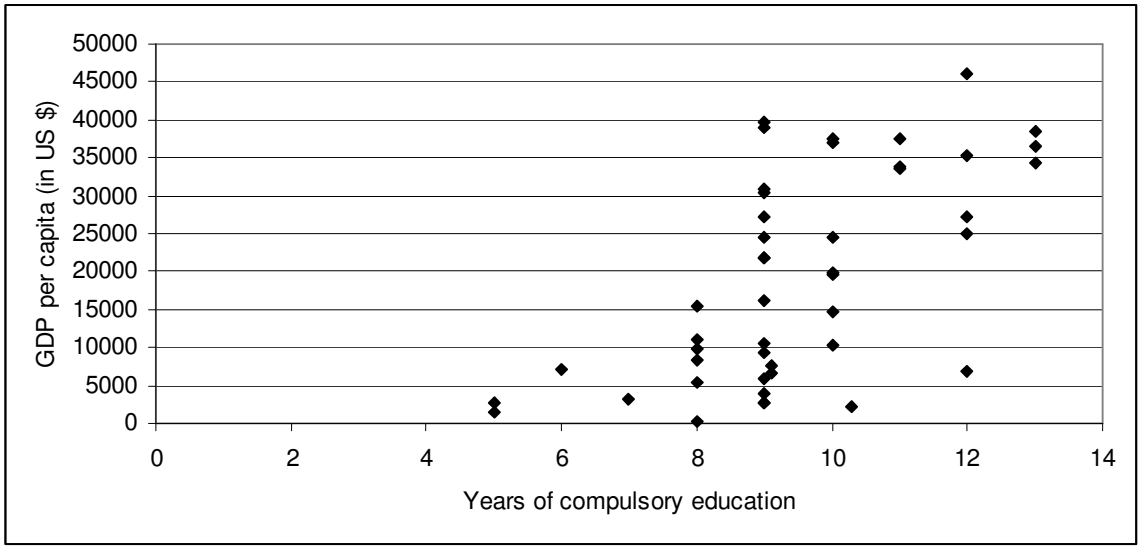
[20] We hope to empirically address this 'guest-workers selectivity' argument later on in a separate paper.

[21] The high average test results of Finnish pupils in all three PISA waves (2000, 2003, and 2006) have instigated the discussion in for example Germany as whether to transform the German differential system of Hauptschule, Realschule, and Gymnasium into the Finnish comprehensive school system.

Figure 1. A schematic overview of the studies on the influence of several societal and educational system features on various immigrant outcomes (labour market integration, language proficiency, perceived discrimination, and educational performance).

<table>
<tr><td colspan="2" rowspan="2">Independent variables</td><td colspan="8">Dimensions of immigrant integration (Y)</td></tr>
<tr><td colspan="2">Labour market integration</td><td>Language proficiency</td><td>Perceived discrimination</td><td colspan="4">Educational performance</td></tr>
<tr><td rowspan="2">Societal features</td><td>(Immigrant) policies</td><td></td><td rowspan="2">Fleischmann and Dronkers (2008)</td><td></td><td rowspan="2">André, Dronkers, and Fleischmann (in press)</td><td></td><td></td><td rowspan="3">De Heus and Dronkers</td></tr>
<tr><td>General societal features</td><td>van Tubergen, Maas, and Flap (2004)</td><td>van Tubergen and Kalmijn (2005)</td><td>Levels, Dronkers, and Kraaykamp (2008)</td><td></td></tr>
<tr><td>Education system features</td><td></td><td></td><td></td><td></td><td></td><td></td><td>De Heus, Dronkers, and Levels (in press)</td></tr>
</table>

Figure 2. The relationship between origin countries' years of compulsory education and economic development (as GDP per capita)



Sources: CIA World Factbook 2008 and World Data on Education (UNESCO) 2006

Table 1. An overview of the number of immigrant pupils by country of origin and country of destination.

	Destination countries																
	AU	AT	BE	CH	DE	DK	EL	FI	LI	LU	LV	NL	NO	NZ	PT	SC	Total
Origin countries																	
Albania	0	13	0	125	0	0	187	0	1	0	0	0	0	0	0	0	326
Australia	0	0	0	0	0	0	0	0	0	0	0	0	0	54	0	0	54
Austria	0	0	0	31	0	0	0	0	21	0	0	0	0	0	0	0	52
Bangladesh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5
Belarus	0	0	0	0	0	0	0	0	0	0	107	0	0	0	0	0	107
Belgium	0	0	0	0	0	0	0	0	0	89	0	0	0	0	0	0	89
Bosnia Herzegovina	0	136	0	0	13	40	0	0	0	0	0	0	0	0	0	0	189
Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	0	45
Cap Verde	0	0	0	0	0	0	0	0	0	80	0	0	0	0	0	0	80
China	252	8	0	0	0	0	0	0	0	0	0	0	0	117	4	16	397
The Congo	0	0	137	0	0	0	0	0	0	0	0	0	0	0	0	0	137
Croatia	0	36	0	0	14	0	0	0	0	0	0	0	0	0	0	0	50
Czech Republic	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
Denmark	0	0	0	0	0	0	0	0	0	0	0	0	24	0	0	0	24
Estonia	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	8
France	0	0	125	119	0	0	0	0	2	184	0	0	0	0	0	0	430
Germany	0	44	147	173	0	0	0	0	16	100	0	90	0	0	0	0	570
Greece	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	15
Hungary	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
India	104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	107
Italy	0	0	0	300	30	0	0	0	13	98	0	0	0	0	0	0	441
Rep. of Korea	69	0	0	0	0	0	0	0	0	0	0	0	0	76	0	0	145
Liechtenstein	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4
Macedonia	0	18	0	0	4	0	0	0	0	0	0	0	0	0	0	0	22
Morocco	0	0	225	0	0	0	0	0	0	0	0	0	0	0	0	0	225
The Netherlands	0	0	95	0	0	0	0	0	0	0	0	0	0	0	0	0	95
New Zealand	263	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	263
Pakistan	0	0	0	0	0	25	0	0	0	0	0	0	0	0	0	17	42
The Philippines	134	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	134
Poland	0	25	94	0	77	0	0	0	0	0	0	0	0	0	0	0	196
Portugal	0	0	0	241	0	0	0	0	6	799	0	0	0	0	0	0	1046
Romania	0	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
Russia	0	0	0	0	79	0	0	25	0	0	186	0	0	0	0	0	290
Samoa	0	0	0	0	0	0	0	0	0	0	0	0	0	130	0	0	130
Serbia Montenegro	0	78	0	952	21	0	0	0	14	0	0	0	0	0	0	0	1065
Slovakia	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
Slovenia	0	4	0	0	1	0	0	0	0	0	0	0	0	0	0	0	5
South Africa	112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	112
Spain	0	0	0	119	0	0	0	0	3	0	0	0	0	0	0	0	122
Sweden	0	0	0	0	0	0	0	11	0	0	0	0	39	0	0	0	50
Switzerland	0	0	0	0	0	0	0	0	63	0	0	0	0	0	0	0	63
Turkey	0	161	156	244	198	81	0	0	11	0	0	505	0	0	0	0	1356
Ukraine	0	0	0	0	0	0	0	0	0	0	101	0	0	0	0	0	101
United Kingdom	490	0	0	0	0	0	0	0	0	0	0	0	0	200	0	0	690
United States	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47
Vietnam	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33
Total	1504	575	979	2308	452	146	187	44	150	1350	394	595	63	577	49	41	9414

Notes: AU=Australia; AT=Austria; BE=Belgium; CH=Switzerland; DE=Germany; DK=Denmark; EL=Greece; FI=Finland; LI=Liechtenstein; LU=Luxembourg; LV=Latvia; NL=the Netherlands; NO=Norway; NZ=New Zealand; PT=Portugal; SC=Scotland.
Source: PISA 2006.

Table 2. Average scientific literacy of immigrant pupils per country of destination and country of origin (N=9414)

	Destination countries																
	AU	AT	BE	CH	DE	DK	EL	FI	LI	LU	LV	NL	NO	NZ	PT	SC	Mean
Origin countries																	
Albania	0	412	0	359	0	0	434	0	358	0	0	0	0	0	0	0	404
Australia	0	0	0	0	0	0	0	0	0	0	0	0	0	548	0	0	548
Austria	0	0	0	495	0	0	0	0	554	0	0	0	0	0	0	0	519
Bangladesh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	476	476
Belarus	0	0	0	0	0	0	0	0	0	0	504	0	0	0	0	0	504
Belgium	0	0	0	0	0	0	0	0	0	528	0	0	0	0	0	0	528
Bosnia Herzegovina	0	445	0	0	451	421	0	0	0	0	0	0	0	0	0	0	440
Brazil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	464	0	464
Cap Verde	0	0	0	0	0	0	0	0	0	380	0	0	0	0	0	0	380
China	562	518	0	0	0	0	0	0	0	0	0	0	0	547	458	483	552
The Congo	0	0	427	0	0	0	0	0	0	0	0	0	0	0	0	0	427
Croatia	0	458	0	0	433	0	0	0	0	0	0	0	0	0	0	0	451
Czech Republic	0	569	0	0	0	0	0	0	0	0	0	0	0	0	0	0	569
Denmark	0	0	0	0	0	0	0	0	0	0	0	0	411	0	0	0	411
Estonia	0	0	0	0	0	0	0	437	0	0	0	0	0	0	0	0	437
France	0	0	448	507	0	0	0	0	446	505	0	0	0	0	0	0	488
Germany	0	521	508	549	0	0	0	0	550	532	0	504	0	0	0	0	526
Greece	0	0	0	0	419	0	0	0	0	0	0	0	0	0	0	0	419
Hungary	0	561	0	0	0	0	0	0	0	0	0	0	0	0	0	0	561
India	551	0	0	0	0	0	0	0	0	0	0	0	0	0	0	541	551
Italy	0	0	0	443	415	0	0	0	445	430	0	0	0	0	0	0	438
Rep. of Korea	514	0	0	0	0	0	0	0	0	0	0	0	0	528	0	0	521
Liechtenstein	0	0	0	496	0	0	0	0	0	0	0	0	0	0	0	0	496
Macedonia	0	407	0	0	433	0	0	0	0	0	0	0	0	0	0	0	411
Morocco	0	0	438	0	0	0	0	0	0	0	0	0	0	0	0	0	438
The Netherlands	0	0	522	0	0	0	0	0	0	0	0	0	0	0	0	0	522
New Zealand	508	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	508
Pakistan	0	0	0	0	0	383	0	0	0	0	0	0	0	0	0	454	412
The Philippines	512	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	512
Poland	0	523	439	0	497	0	0	0	0	0	0	0	0	0	0	0	473
Portugal	0	0	0	454	0	0	0	0	445	420	0	0	0	0	0	0	428
Romania	0	439	0	0	0	0	0	0	0	0	0	0	0	0	0	0	439
Russia	0	0	0	0	466	0	0	550	0	0	496	0	0	0	0	0	493
Samoa	0	0	0	0	0	0	0	0	0	0	0	0	0	425	0	0	425
Serbia Montenegro	0	426	0	427	414	0	0	0	417	0	0	0	0	0	0	0	467
Slovakia	0	507	0	0	0	0	0	0	0	0	0	0	0	0	0	0	507
Slovenia	0	416	0	0	435	0	0	0	0	0	0	0	0	0	0	0	420
South Africa	541	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	541
Spain	0	0	0	466	0	0	0	0	516	0	0	0	0	0	0	0	467
Sweden	0	0	0	0	0	0	0	522	0	0	0	0	465	0	0	0	477
Switzerland	0	0	0	0	0	0	0	0	521	0	0	0	0	0	0	0	521
Turkey	0	380	414	425	411	374	0	0	389	0	0	466	0	0	0	0	429
Ukraine	0	0	0	0	0	0	0	0	0	0	472	0	0	0	0	0	472
United Kingdom	542	0	0	0	0	0	0	0	0	0	0	0	0	569	0	0	550
United States	571	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	571
Vietnam	518	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	518
Mean immigrants	536	437	453	444	438	388	434	522	498	445	492	472	444	525	464	474	468
Mean natives	524	525	527	527	531	501	480	565	540	512	495	540	492	537	482	516	518
Difference (I-N)	12	-88	-74	-83	-93	-113	-46	-43	-42	-67	-3	-68	-48	-12	-18	-42	-50

Notes: AU=Australia; AT=Austria; BE=Belgium; CH=Switzerland; DE=Germany; DK=Denmark; EL=Greece; FI=Finland; LI=Liechtenstein; LU=Luxembourg; LV=Latvia; NL=the Netherlands; NO=Norway; NZ=New Zealand; PT=Portugal; SC=Scotland.
Source: PISA 2006.

Table 3. Descriptive statistics of variables (N=9414)

	Minimum	Maximum	Mean	Standard Deviation
Dependent variable				
Scientific literacy	130.30	841.04	468.35	103.10
Educational system variables				
Student-teacher ratio in primary education (destination)	10	18	13.64	2.59
Expenditure on education as percentage of total government expenditure (destination)	5.3	20.9	12.22	2.96
Achievement data tracked over time by an administrative authority (destination)	33.80	98.90	63.54	21.07
Compulsory years of education (origin)	5	13	9.75	1.55
Societal features (destination)				
Average science performance natives	479.77	565.41	523.08	12.68
MIPEX Total	30	79	53.39	9.42
MIPEX labour market access	20	90	59.72	14.95
MIPEX family reunion	34	84	50.94	9.04
MIPEX long term residence	48	74	57.06	8.05
MIPEX political participation	11	86	55.91	18.38
MIPEX access to nationality	22	71	44.45	11.85
MIPEX anti-discrimination	33	87	52.28	15.87
Employment Protection Legislation	0.65	3.74	1.75	0.64
Left Wing Government	0	20	12.10	3.49
GDP per capita	17700	80800	42408.41	16632.55
Net Migration Rate	-2.27	8.64	3.33	2.51
Liberal Welfare System	0	1	0.23	0.42
Social Democratic Welfare System	0	1	0.03	0.16
Conservative Welfare System	0	1	0.68	0.47
Mediterranean Welfare System	0	1	0.03	0.16
Ex-communistic Welfare System	0	1	0.04	0.20
Traditional immigrant receiving country	0	1	0.22	0.41
Level of individualization (Hofstede)	27	90	69.56	13.67
Societal features (origin)				
Human Development Index	0.41	0.96	0.85	0.10
GDP per capita	300	46000	18124.40	12259.81
Country without religious affiliation	0	1	0.01	0.06
Catholic country	0	1	0.42	0.49
Protestant country	0	1	0.10	0.29
Eastern orthodox country	0	1	0.17	0.38
Prevalently Christian country (ref)	0	1	0.01	0.12
Islamic country	0	1	0.23	0.42
Eastern religious country	0	1	0.05	0.23
Country without prevalent religion	0	1	0.02	0.13
Kaufmann indicator of political stability	-2.31	1.92	0.04	0.74
Net Migration Rate	-11.83	9.65	1.0	2.41
Political Freedom	1	7	5.47	1.75
Civil Rights	1	6	4.75	1.43
Level of individualization (Hofstede)	14	91	48.90	21.70
Community variables				
Socio-economic and cultural distance	-1.38	1.39	0	0.46
Community size	.02	18.75	4.75	5.13
Relative percentage first generation immigrants	-39.41	66.65	0	19.41
Relative percentage second generation immigrants	-64.66	40.32	0	19.33
Individual variables				

Parental socio-economic and cultural capital	-4.44	2.97	-.023	1.02
Second generation immigrant	0	1	0.50	0.50
Missing dummy immigrant generation	0	1	0.04	0.19
One native parent	0	1	0.06	0.23
Language of test spoken at home	0	1	0.50	0.50
Missing dummy language spoken at home	0	1	0.11	0.31
Arrival age	0	16	5.63	3.46
Female	0	1	0.50	0.50

Table 4. Cross-classified regression of societal characteristics of countries of origin and destination, community characteristics, and individual characteristics on the scientific literacy of immigrant pupils; Nd=16, No=46, Nc=91, Ni=9414

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Intercept	467.48* (7.35)	471.47* (3.60)	466.51* (3.30)	464.04* (7.84)	467.37* (2.56)	462.50* (2.60)
Destination effects						
Average science performance natives		0.50* (0.24)			0.49* (0.18)	0.50* (017)
Traditional immigrant receiving country		59.36* (9.35)			51.68* (8.38)	47.21* (8.40)
Origin effects						
Catholic country			ref.		ref.	ref.
Protestant country			1.14 (12.88)		2.54 (10.84)	2.28 (10.84)
Eastern orthodox country			-11.80 (11.04)		0.95 (9.16)	-0.88 (9.16)
Prevalently Christian country			-56.51* (26.23)		-51.35* (22.76)	-49.78* (22.90)
Islamic country			-26.39* (10.62)		-16.32 (9.39)	-24.79* (9.49)
Eastern religious country			49.27* (14.07)		44.53* (12.87)	49.72* (12.87)
Country without prevalent religion			0.14 (16.80)		-2.78 (15.42)	-13.10 (15.65)
Country without religious affiliation			54.31* (22.84)		56.43* (21.64)	59.41* (21.68)
GDP per capita			0.00 (0.00)		0.00 (0.00)	0.00 (0.00)
Net migration rate			2.55* (1.13)		1.54 (1.00)	1.51 (1.00)
Community effects						
Relative communal economic and socio-cultural capital				37.23* (6.21)	24.77* (6.27)	28.15* (6.55)
Individual effects						
Second generation immigrant	7.01* (2.06)	6.95* (2.06)	7.21* (2.06)	7.13* (2.06)	7.21* (2.04)	7.85* (2.04)
Immigrant generation unknown	-18.05*(4.59)	-18.12*(4.59)	-18.22*(4.59)	-18.14* (4.59)	-18.43*(4.58)	-18.55* (4.55)
One native parent	5.39 (4.10)	5.51 (4.10)	4.75 (4.10)	4.79 (4.10)	5.04 (4.09)	6.91 (4.14)
Language of test country spoken at home	17.62* (2.44)	17.96* (2.43)	17.38* (2.43)	16.24* (2.44)	17.54* (2.42)	17.38* (2.41)
Language spoken at home unknown	-28.50*(3.06)	-28.51*(3.05)	-28.40*(3.05)	-29.13* (3.05)	-28.77* (3.05)	-28.72* (3.03)
Arrival age	-2.79* (0.29)	-2.81* (0.29)	-2.77* (0.29)	-2.82* (0.29)	-2.82* (0.29)	-5.02* (0.52)
Parental economic and socio-cultural status	29.72* (1.0)	29.75* (1.0)	29.61* (1.00)	29.19* (1.01)	29.19* (1.01)	28.34* (1.34)
Girls	-2.38 (1.72)	-2.39 (1.72)	-2.43 (1.72)	-2.37 (1.72)	-2.43 (1.72)	-3.02 (1.71)
Cross-level interactions						
Destination						
Parental economic and socio-cultural status * Traditional immigrant receiving country						11.87* (2.72)

Origin						
Second generation immigrant * Country without prevalent religion						80.41* (20.21)
Parental economic and socio-cultural status * Islamic country						-5.13* (2.44)
Arrival age * GDP per capita						0.00* (0.00)
Community						
Second generation immigrant * relative communal economic and socio-cultural capital						-13.72* (4.04)
Parental economic and socio-cultural status * relative communal economic and socio-cultural capital						17.69* (2.25)
Variance components						
Destinations	566 (300.24)	0 (0)	430 (206.77)	775 (343.83)	0 (0)	0 (0)
Origins	962 (193.86)	896 (164.62)	419 (96.08)	547 (120.11)	345 (73.58)	346 (73.44)
Communities	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Individuals	6910 (101.17)	6910 (101.17)	6909 (101.14)	6911 (101.18)	6909 (101.12)	6787 (99.34)
Total unexplained variance	8438	7706	7758	8233	7254	7133
Deviance (IGLS; -2*LL)	110152.00	110128.80	110100.40	110124.60	110065.90	109899.50

Table 5. Cross-classified regression of educational system characteristics and societal characteristics of countries of origin and destination, community characteristics, and individual characteristics on the scientific literacy of immigrant pupils; Nd=16, No=46, Nc=91, Ni=9414

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Intercept	463.92* (2.96)	469.29* (2.90)	467.51* (2.39)	468* (2.45)	463.42* (2.33)	463.16* (2.39)
Educational system features						
Destination effects						
Student-teacher ratio (primary)	6.74* (1.51)	5.76* (1.66)	5.36* (1.24)	4.43* (1.42)	4.03* (1.33)	4.22* (1.36)
Expenditure on education as percentage of total government expenditure	1.57 (1.08)	NS	2.72* (0.96)	NS	1.05 (1.00)[1]	1.15 (1.02)
Achievement data tracked over time by an administrative authority	0.41* (0.19)	NS	0.30* (0.15)	NS	NS	NS
Origin effects						
Compulsory years of education	6.15* (2.04)	6.01* (1.87)	6.02* (1.71)	6.56* (1.71)	6.99* (1.74)	6.63* (1.77)
Societal features						
Destination effects						
Average science performance natives		NS		NS	NS	NS
Traditional immigrant receiving country		38.06* (10.51)		30.64* (10.22)	24.32* (10.18)	19.85 (10.42)
Origin effects						
Catholic country			ref.	ref.	ref.	ref.
Protestant country			3.01 (9.77)	3.21 (9.74)	6.05 (9.86)	2.79 (9.77)
Eastern orthodox country			-6.00 (7.77)	-4.48 (7.80)	-1.88 (7.80)	-3.03 (7.72)
Prevalently Christian country			0 (0)	0 (0)	0 (0)	0 (0)
Islamic country			-13.41 (7.51)	-14.93* (7.39)	-15.59* (6.71)	-16.08* (7.42)
Eastern religious country			44.20* (11.32)	43.83* (11.35)	46.64* (11.33)	46.46* (11.22)
Country without prevalent religion			11.13 (15.14)	10.87 (15.17)	16.35 (15.32)	3.93 (15.48)
Country without religious affiliation			61.96* (20.86)	55.84* (21.01)	54.35* (21.02)	62.58* (20.91)
GDP per capita			NS	NS	NS	NS
Net migration rate			NS	NS	NS	NS
Community effects						
Relative communal economic and socio-cultural capital	24.23* (6.79)	26.66* (6.55)	20.14* (6.20)	18.82* (6.19)	17.10* (5.99)	17.14* (6.09)

[1] Not significant but still part of analysis because of interactions with variable.

Individual effects						
Second generation immigrant	8.61* (2.04)	6.86* (2.05)	6.98* (2.04)	7.05* (2.04)	8.66* (2.03)	7.75* (2.04)
Immigrant generation unknown	-18.09* (4.56)	-18.53* (4.58)	-18.75* (4.58)	-18.66* (4.58)	-18.52* (4.55)	-18.78* (4.55)
One native parent	6.60 (4.14)	4.76 (4.09)	4.44 (4.08)	5.01 (4.08)	5.10 (4.09)	5.10 (4.09)
Language of test country spoken at home	16.43* (2.41)	16.28* (2.42)	16.74* (2.40)	16.67* (2.41)	16.72* (2.39)	16.57* (2.39)
Language spoken at home unknown	-28.68* (3.03)	-29.07* (3.05)	-28.76* (3.05)	-28.84* (3.05)	-28.66* (3.03)	-28.83* (3.03)
Arrival age	-2.98* (0.29)	-2.84* (0.29)	-2.84* (0.29)	-2.85* (0.29)	-2.88* (0.28)	-2.87* (0.28)
Parental economic and socio-cultural status	29.64* (1.00)	29.20* (1.01)	29.13* (1.00)	29.15* (1.00)	29.51* (1.00)	28.47* (1.34)
Girls	-3.17* (1.71)	-2.35 (1.72)	-2.41 (1.72)	-2.36 (1.72)	-3.06 (1.71)	-3.11 (1.71)
Cross-level interactions						
Destination						
Second generation immigrant * Expenditure on education as percentage of total government expenditure					3.29* (0.68)	3.24* (0.68)
Parental economic and socio-cultural status * student-teacher ratio (primary)					1.60* (0.39)	NS
Parental economic and socio-cultural status * traditional immigrant receiving country						12.23* (2.72)
Origin						
Second generation immigrant * compulsory years of education					-5.05* (1.25)	-4.71* (1.25)
Second generation immigrant * country without a prevalent religion						68.72* (20.22)
Parental economic and socio-cultural status * Islamic country						-5.16* (2.44)
Community						
Parental economic and socio-cultural status * relative communal economic and socio-cultural capital					18.36* (2.14)	16.93* (2.25)
Variance components						
Destinations	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Origins	503 (100.14)	495 (99.16)	284 (62.79)	300 (66.07)	251 (57.31)	266 (59.76)
Communities	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Individuals	6809 (99.67)	6909 (101.14)	6910 (101.13)	6909 (101.11)	6819 (99.80)	6797 (99.48)
Total unexplained variance	7312	7404	7194	7209	7070	7063
Deviance (IGLS; -2*LL)	109952.40	110088.10	110056.20	110057.80	109925.10	109897.80

Appendix I: Determining pupils' country of origin and immigrant status

This appendix provides a comprehensive description of the decision rules that have been used to determine pupils' country of origin and immigrant generation. Table A1 schematically displays these rules and will be described below.

The *country of origin* was based on information on the birth countries of both the pupil and the parents. In table A1, the letter T indicates that the birth country equals the country of destination, and the letters A,B, and C refer to countries of birth other than the destination country. In order to determine the country of origin, the following decision rules have been used:
1. If all three countries of birth were known and the same, this country became the country of origin.
2./4. If two countries of birth were known and the same and the other country was either different or unknown, the country of birth that was mentioned twice became the country of origin.
3. If all three countries of birth were known but different, the mother's country of birth was coded as country of origin.
5. If two countries of birth were unknown, the known birth country became the origin country.
6. If, on the other hand, two countries of birth were known but not the same and the other country was unknown, the parents' birth countries overruled the child's, and the mother's overruled the father's.
7. And finally, if all three countries of birth were unknown, the country of origin was also decided to be missing. However, in a few exceptional cases were sound arguments convinced us to do so, we decided to abandon this rule (e.g., the 'missing' Vietnamese speaking pupils in Australia who have ultimately received Vietnam as origin country).

The *immigrant status* was also based on the combination of the student's birth country and her/his parents' birth countries.
- Natives are those students who originated from the country of destination (T), irrespective of their country of birth.
- Immigrants are those students who originated from a country outside the country of destination, with:
• first generation immigrants born outside the country of destination.
• second generation immigrants born in the country of destination.

For those immigrants who had a missing value on the country of birth, the generation is unknown.

Table I.1. A schematic overview of the decision rules used to determine a pupil's country of origin and immigrant status.

	Country of birth student	Country of birth mother	Country of birth father	Country of origin	Immigrant status
1	A	A	A	A[2]	I, first generation
	T	T	T	T[3]	N
2	B	A	A	A	I, first generation
	T	A	A	A	I, second generation
	A	T	T	T	N
	A	B	A	A	I, first generation
	A	T	A	A	I, first generation
	T	A	T	T	N
	A	A	B	A	I, first generation
	A	A	T	A	I, first generation
	T	T	A	T	N
3	A	B	C	B	I, first generation
	T	A	B	A	I, second generation
	A	T	B	T	I, second generation
	A	B	T	B	I, first generation
4	Miss.	A	A	A	I, generation unknown
	Miss.	T	T	T	N, country of birth unknown
	A	Miss.	A	A	I, first generation
	T	Miss.	T	T	N
	A	A	Miss.	A	I, first generation
	T	T	Miss.	T	N
5	Miss.	Miss.	A	A	I, generation unknown
	Miss.	Miss.	T	T	N, country of birth unknown
	Miss.	A	Miss.	A	I, generation unknown
	Miss.	T	Miss.	T	N, country of birth unknown
	A	Miss.	Miss.	A	I, first generation
	T	Miss.	Miss.	T	N
6	B	Miss.	A	A	I, first generation
	T	Miss.	A	A	I, second generation
	A	Miss.	T	T	N
	B	A	Miss.	A	I, first generation
	T	A	Miss.	A	I, second generation
	A	T	Miss.	T	N
	Miss.	B	A	B	I, generation unknown
	Miss.	T	A	T	N, country of birth unknown
	Miss.	A	T	A	I, generation unknown
7	Miss.	Miss.	Miss.	Miss.	Miss.

[2] Country of origin *not* equal to current destination country
[3] Country of origin equal to current destination country

Appendix II: Bivariate results

Table II.1. The coefficients, standard errors and improvement in model fit in a stepwise addition of the origin, destination, and community features to model 1 of table 4.

		Co.	SE	IMF
Destination effects	Average science performance natives	0.731*	0.337	4.3
	MIPEX Total	0.465	0.616	0
	MIPEX labour market access	0.368	0.456	0
	MIPEX family reunion	0.786	0.579	0
	MIPEX long term residence	-0.257	0.926	0
	MIPEX political participation	-0.097	0.353	0
	MIPEX access to nationality	0.376	0.530	0
	MIPEX anti-discrimination	0.609	0.411	2
	Employment Protection Legislation	-17.338	9.061	2.1
	Left Wing Government	-1.516	1.732	0.7
	GDP per capita	0.000	0.001	0
	Net Migration Rate	1.894	3.247	0.3
	Liberal Welfare System	ref	ref	ref
	Social Democratic Welfare System	-72.019*	15.024	16.4
	Conservative Welfare System	-53.644*	9.314	16.4
	Mediterranean Welfare System	-58.701*	22.609	16.4
	Ex-communistic Welfare System	-52.761*	20.2761	16.4
	Traditional immigrant receiving country	62.303*	9.51	18.8
	Level of individualisation (Hofstede)	0.628	0.421	1.9
Origin effects	Human Development Index	104.379*	35.635	8.1
	GDP per capita	0.001*	0.000	13.8
	Country without religious affiliation	ref	ref	ref
	Catholic country	-46.733	24.122	39.9
	Protestant country	-31.753	25.71	39.9
	Eastern orthodox country	-69.153*	25.345	39.9
	Prevalently Christian country	-115.328*	35.641	39.9
	Islamic country	-87.402*	24.817	39.9
	Eastern religious country	-9.195	25.965	39.9
	Country without prevalent religion	-44.233	28.661	39.9
	Kaufmann indicator of political stability	9.112	4.977	3.2
	Net Migration Rate	3.745*	1.305	7.6
	Political Freedom	1.038	2.184	0.2
	Civil Rights	1.398	2.715	0.2
	Level of individualisation (Hofstede)	0.375*	0.181	4.1
Community effects	Socio-economic and cultural distance	37.23*	6.21	27.4
	Community size	-0.38	1.28	0
	Relative percentage first generation immigrants	0.29	0.18	2.5
	Relative percentage second generation immigrants	-0.30	0.18	2.6

Appendix III: Random effects across origins and destinations

Table III.1. The degree to which individual-level effects differ across countries of destination and countries of origin (based on table 5, model 4).

	Fixed coefficient	Slope variance: destination	Slope variance: origin	IMF
Second generation immigrant	7.82* (3.15)	250.51* (90.45)	0 (0)	21.9
Immigrant generation unknown	-19.99* (6.03)	586.54 (329.03)	0 (0)	11.1
One native parent	4.66 (4.92)	255.96 (194.64)	0 (0)	8.4
Language of test country spoken at home	17.06* (2.63)	35.55 (44.79)	0 (0)	4.4
Language spoken at home unknown	-29.71* (3.55)	0 (0)	73.07 (84.85)	4.3
Arrival age	-2.59* (0.43)	4.77* (1.89)	0 (0)	17.8
Parental economic and socio-cultural status	No convergence			
Girls	-2.61 (1.95)	0 (0)	33.12 (34.51)	5.4

Source: PISA 2006