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Article

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ORIGINAL ARTICLE

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Parents' years in Sweden and children's educational performance

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Abstract

This paper assesses the intergenerational effect of immigrant parents' incorporation experiences, measured as time in Sweden, on the educational performance of their children, using full Swedish population registry data for 22 cohorts. Employing family fixed-effects, we examine final course grades and national standardized test scores in Swedish and math by parents' country of origin. Results show a positive effect of parents' time in Sweden on their children's performance in Swedish, but not for math performance. These results demonstrate the importance of parents' linguistic acculturation on their children's educational performance.

Jel codes: I21, J15, J62

Keywords: Intergenerational mobility, Immigrant incorporation, Years since migration, Second generation, Family fixed-effects

1 Introduction

Over the last half century, the proportion of second-generation immigrants in Sweden has risen from being virtually nonexistent to approximately 10 % (Westin 2003; Bengtsson et al. 2005). While considerable country of origin and gender variation exists, the schooling experiences of second-generation immigrants are generally poorer than among children of native-born Swedes, on teacher-assigned grades as well as on national and international standardized tests (OECD 2010; Jonsson and Rudolphi 2011). This study seeks to understand to what extent immigrant parents' incorporation experiences, here measured as parents' years since migration (PYSM), affect the educational performance for their second-generation immigrant children.

According to assimilation theory (Alba and Nee 2003), time and generation in a host country will lead to linguistic acculturation, increased institutional familiarity, and increased economic and social capital. These processes could allow immigrant parents to be more comfortable and capable at influencing their children's educational performance. Though previous studies consider the effect of an immigrant's time in the country, measured as age at migration, on their own outcomes (Böhlmark 2008; van Ours and Veenman 2006; Goldner and Epstein 2014), fewer have explicitly considered whether time in the host country could be associated with intergenerational effects. Though second-generation children will have resided in the host country for the same number of years as their native peers, their immigrant parents will be characterized by widely differing exposures to the destination country. More specifically, immigrant

parents vary in their amount of exposure to the host country language, culture and norms, and, as a result, their level of incorporation. The parents' accumulated incorporation experiences in a host country could influence their ability and willingness to assist in their children's schooling and, as a result, impact their children's school performance.

There are several potential pathways as to how parents' accumulated incorporation experiences might impact their children's educational performance. The clearest example of this is a direct relationship through parents' linguistic acculturation and children's language proficiency (Bleakley and Chin 2008; Casey and Dustmann 2008), which then extends to their school performance and, specifically, their language class performance. Indirect mechanisms of parental incorporation that could influence their children's educational performance include increased economic and social capital, familiarity with the school system (Kristen 2008; Turney and Kao 2009), and coming to view migration as a permanent rather than temporary move (Dustmann 2008), all of which would lead parents to being more able and willing to involve themselves with their children's education. This impact could lead to an increase in performance in those subjects that are less host country specific. In Denmark, for example, Nielsen and Rangvid (2012) found evidence that a mother's time spent in the country helped with their children's Danish performance, while additional time for the father helped with their math performance, which may suggest that both specific and general mechanisms of incorporation can be transmitted across generations.

To study the impact of PYSM on their children's educational performance, we use the Swedish Interdisciplinary Panel (SIP) database, which contains registry data on the full population born between 1973 and 1995. We analyze second-generation immigrants who graduated from Swedish primary schools between 1989 and 2011, generally occurring at age 16. We consider class grades and test scores in Swedish and math due to the varying degree of Swedish-specific skills required by these two subjects.

Typically, estimating the impact of parents' time spent in the host country on their children's educational performance using either longitudinal or cross-sectional data represents a considerable challenge. This is the result of selection and omitted variable bias in the relationship between when individuals migrate, when they have children, and their preferences for their children's educational attainment, putting analyses at risk of getting (upwardly) biased results (Chiswick and Miller 1995). In attempting to avoid this issue, we exploit the linkage in the data of parents to their children, allowing for a family fixed-effects approach. In doing so, the influence of all time invariant observed and unobserved family level characteristics are cancelled out, allowing us to remove the likely source of bias.

Using multinomial logistic regression with family fixed-effects and stratifying our analysis by parents' country of origin over nearly three decades of second-generation cohorts, this is the first study to consider in detail how the effect of parents' time in Sweden on children's educational performance varies by parents' background. Analyses done on students' course grade and standardized test scores show an impact of PYSM on grades in Swedish, but not math, across nearly all country of origin groups. That the relationship is found for Swedish performance, but not math, points towards the potential effect for intergenerational transmission of parent's linguistic acculturation. The neutral relationship between PYSM and math performance across all immigrant groups

suggests that general effects of parent's incorporation, such as increased familiarity with the school system and social capital, are less important for children's performance, at least as measurable between siblings. Parents' incorporation, then, can be said to have the potential to affect their children's Swedish, but not math, performance. Though this is true across all immigrant groups, this finding is perhaps most notable among those groups from Africa, the Middle East, and South America, for whom incorporation has been deemed "less successful" and Swedish language and culture are most distinct.

2 Background

2.1 Age at migration and incorporation

According to new assimilation theory, the time an immigrant spends in a host country is expected to lead to increased destination country language skills as well as greater economic and social capital (Alba and Nee 2003; Gordon 1964). This is the result of day-to-day decisions that immigrants make to maximize their wellbeing. The effect of these processes should provide immigrant parents a means to boundary-cross (Alba 2005; Alba 2009) and become more capable and comfortable with social institutions, as well as being characterized by increased cultural familiarity. As a result of these experiences, immigrant parents with more time in the host country could be better equipped to involve themselves and positively influence their children's education program. An alternative perspective, the segmented assimilation hypothesis, states that, although incorporation can lead to upward social mobility, it is not a foregone conclusion that it will occur. Some immigrant groups will generally travel along the aforementioned normative assimilation path or through assimilation with retained biculturalism, both of which would be expected to produce a positive relationship between parents' time spent in a host country and their incorporation, possibly, then, having a spillover effect on their children's school performance. Alternatively, immigrants from groups who are most culturally and ethnically distinct and meet a negative context of reception are at risk of undergoing a process of dissonant acculturation and downward assimilation (Haller et al. 2011; Portes and Rumbaut 2001) in which parents do not achieve upward social mobility and do not develop language or other host country-specific skills that would help their children in school. As a result, the relationship between PYSM and children's school performance is likely to be neutral.

Studies looking at the effect of age at migration among first-generation immigrants find that arriving earlier in life has positive effects on broad range of incorporation measures, including education attainment, language proficiency, and social incorporation (Yao and van Ours 2015; Böhlmark 2008). In assessing the effect of age at migration on educational attainment, researchers found that those who immigrate as young children, before age 10, have better education outcomes and perform more similarly to the native-born second generation rather than those who immigrate at age 10 or later (van Ours and Veenman 2006; Schaafsma and Sweetman 2001; Bleakley and Chin 2010; Rumbaut 2004; Goldner and Epstein 2014). The focus of most of these studies, however, was on the difference between those immigrating at earlier ages relative to those who immigrated later in childhood or as teenagers or older. The effects of immigrating at various points in young adulthood are less well understood. Beyond educational performance and attainment, spending more time in a host country has a positive relationship with language proficiency (Sweetman and Van Ours 2014), wages

and promotions (Yao and van Ours 2015; Chiswick and Miller 2014), intermarriage (Stevens and Swicegood 1987; Meng and Gregory 2005), and residential incorporation (Toussaint-Comeau and Rhine 2004; Funkhouser and Ramos 1993; Fafchamps and Shilpi 2013).

Though there is an extensive body of literature on the overall positive effect of years spent in the host country for the foreign born, less is known about how these incorporation experiences are transmitted across generations. Bleakley and Chin (2008) and Casey and Dustmann (2008) assess how language can be transmitted across generations in the USA. Using two methods, an instrumental variable approach and “selection-on-observable” approach, both papers find a strong link between parents’ and children’s language proficiencies. Åslund et al. (2009) and Nielsen and Rangvid (2012) employ family-based designs to examine the effect of parents’ number of years since migration on their children’s education outcomes. Both papers find that a parents’ time spent in the country has a positive effect on their children’s educational performance. Åslund et al. (2009) find that the children’s educational attainment would be extended by 0.2 years if a parent had arrived a decade earlier, while Nielsen and Rangvid (2012) find that mother’s years since migration exercises an effect on children’s performance in Danish, while father’s years since migration has an effect on their math performance.

2.2 Parents’ incorporation and children’s school performance

Parents’ time in a host country can influence their children’s educational performance through host country-specific linguistic acculturation as well as more general mechanisms. Parents’ linguistic acculturation has been found to improve their children’s language skills and grades in language classes (Bleakley and Chin 2008; Casey and Dustmann 2008). This ability may be reflected not only in the children’s performance in Swedish but also in terms of a generally improving educational performance. Additionally, parents’ incorporation can also lead to increased institutional familiarity and a reduced negative impact of cultural distance on children’s school performance (Kristen 2008; Turney and Kao 2009), increased social and cultural capital (Bourdieu 1986; Lareau 2011), and the migrant parent coming to view migration as permanent rather than temporary move (Dustmann 2008), all of which have been documented to have a positive effect on children’s school performance. These mechanisms, alongside increased language proficiency, could have the effect of raising their children’s educational performance across all classes, since these would provide general rather than course-specific capital.

Drawing from assimilation theory, we expect that PYSM will improve their children’s educational performance. Conversely, informed by the downward assimilation component of the segmented assimilation hypothesis, individuals from those groups who are the most ethnically, culturally, and phenotypically distinct will exhibit no relationship between PYSM and children’s school performance. Additionally, by examining performance in Swedish and math, we develop additional hypotheses on how incorporation mechanisms may differentially impact performance in these subjects. If performance in Swedish and math increase with PYSM, this would suggest parents’ specific and general incorporation experiences are being transmitted to their children. If Swedish, but not math, performance increases with PYSM, this would suggest PYSM operates through parents’ linguistic acculturation, but not the more general effects from parents’ incorporation.

3 Data and methods

The data analyzed comes from the SIP-ENTRY database. SIP-ENTRY contains longitudinal data on the entire Swedish population born between 1973 and 1995, as well as their parents and siblings born outside the main sampling window, followed until 2012. Information on attained primary school grades and test scores is available from 1989 to 2011 and therefore constitutes the key period of interest. SIP-ENTRY also has information on demographic characteristics, including date of migration, of importance to accurately define an individual's number of years since migration. Through the addition of the multigenerational register, family IDs have been created via linking parents to their biological children. This represents a particular strength of this study as a means of isolating the effects of incorporation and dealing with unobserved individual heterogeneity (Lawlor et al. 2009). Our study sample has been designed to consist of second-generation immigrants, for whom the birthplace and date of immigration on both biological parents are known. Furthermore, the individual must have a reported final course grade in Swedish and math, as well as on national tests for the same subjects. Lastly, this information must also be available for at least one other sibling, in order for family fixed-effects models to be estimated, as explained in more detail in Section 3.2.

3.1 Measures

3.1.1 Education performance

The educational performance considered in this paper includes the individual's teacher-assigned course grades as well as scores on national standardized tests in Swedish and math during the final year of primary school, at age 16. These classes are important, since, in order to pass primary school, students have to earn a passing grade. The course performance forms a basis of whether the student is admitted into college preparatory academic programs or vocational programs at the high school level. Data for teacher-assigned grades covers the entire time frame (1989–2011), but changes in grading between the 1997 and 1998 graduating cohort (Wikström 2005) lead to different grade distributions. As a result, we include a dummy variable for pre- and post-1998 years in the analysis on teacher-assigned grades. We also consider standardized test performance, covering the period between 2005 and 2011. Arguably, the tests represents a more pure indicator of the student's knowledge, as it is well known that course grades may be affected by various unobserved factors, including classroom behavior and teacher differences in grading routines. Instead, the standardized tests are taken by all ninth grade students at the same time, with the scoring being performed by the teacher, however, following common and strict guidelines. Thus, standardized tests have been developed to be comparable at the national level, also providing teachers with a benchmarking tool to help them assess their students' mastery. The grade categories for both instruments include "Fail," "Passed," "Passed with distinction," and "Passed with highest distinction." In the analyses, these remain categorical variables.

3.1.2 Parents' country of origin

In defining the study population, we use information on the individual's and their parents' country of birth. Using this information, we are able to identify individuals belonging to the second-generation immigrant, being the focus of the empirical analysis. The sample is limited to individuals who are born in Sweden and on whom we are able to

identify both parents as being born abroad, defined as belonging to the second generation. Consequently, we exclude individuals for whom we only have information for one of the parents.

Linked to the grouping of countries of origin in SIP-ENTRY, the analysis will examine individuals by the following country of origin groups: Africa, East Africa (Ethiopia, Somalia, and Eritrea), Iraq, Iran, Lebanon, Turkey, Thailand, Vietnam, Asia/Oceania, Chile, South America, non-EU-27 and Czech/Slovakia, former Yugoslavia, former Soviet Union and Poland, North America and EU-27, and Nordic (Finland, Denmark, and Norway) countries. Albeit somewhat subjective, the list of country groups displays their respective degree of socio-cultural similarity, in ascending order. Following Jonsson and Rudolphi (2011), among individuals whose parents come from two separate countries, they are assigned the “closest” of the two regions of origin.

3.1.3 Years since migration

Information on migration contains the exact date of immigration to Sweden starting in 1973. For those that arrived before 1973, we therefore rely on the 1960, 1965, and 1970 censuses to assess if they were present in Sweden before 1960, between 1960 and 1965, or between 1965 and 1970. When constructing age at migration, these individuals are ascribed the years 1959, 1962, and 1967, respectively. The PYSM is hence derived as the number of years spent in Sweden at the year of the examined individual’s birth. We use the value of the parent from the culturally closest country with the greatest YSM, as they represent the most potential accumulated incorporation experiences.

3.2 Methods

The focus of the analyses is towards estimating the impact of parents’ years spent in Sweden on the children’s educational performance in two core subjects within Swedish primary school: Swedish and math. To this end, we begin by descriptively comparing the sample characteristics in terms of class grades, test scores, and PYSM. These are displayed by parents’ country of origin and, for PYSM, include the within-family variation. Next, we estimate a series of multinomial logistic regression models on grade and test performance with family fixed-effects (Pforr 2014).

The family fixed-effects approach is well suited to avoid some of the sources of bias which may arise from the PYSM being correlated with the error term. More specifically, it is difficult to assess the causal effect of parents’ time spent in the country of destination using cross-sectional (as well as longitudinal) data, since those who have a longer duration of stay may be fundamentally different from those having stayed for a shorter period of time (Chiswick and Miller 1995). Those who wait longer to have a child after migration might be doing so due to their preferences for their children’s education, thus not necessarily independent of their incorporation experiences. Furthermore, educational outcomes are partly determined by ability, representing another major potential source of omitted variable bias. The family fixed-effects provides a means to control for the influence of all time invariant characteristics, such as genetic traits (50 % shared between siblings) and preferences towards their children’s education, thus removing important potential sources of bias. The drawback of this approach is it necessitates that more than one child is born in Sweden, introducing the question of external validity vis à vis families that only have singletons. If a younger sibling has an

older sibling who has gone through school, it means there are others in the household who are fluent in Swedish and are familiar with the topics that will be covered in these classes; something a singleton does not have access to. Despite this drawback, the proportion of immigrant families in our sample with two or more children born in Sweden is higher than 80 %, so this study captures the lived experience for the overwhelming majority of second-generation immigrants.

The empirical models are estimated by means of multinomial logistic regression with family fixed-effects. The specification follows equation (1), below, where $P(y_{if} = k)$ describes the probability to be in state k out of the possible states $0, \dots, m$ for individual i in family f . Here, these states range from “Fail” to “Pass with very special distinction,” translating to $m = 4$. The propensity function is modeled as a function of a vector of control variables, X_{if} including whether the individual is the oldest sibling and their sex. The key parameter is represented by θ_k , estimated based on the PYSM (Z) when individual i , in family f , was born, estimated separately for each of the k outcomes. The identification of all parameters relies on within-family variation in both independent and dependent variables, while sibling combinations characterized by the same grade/test score will cancel out. Those individuals who are excluded due to the lack of within-family variation are compared to those who are included in Additional file 1: Appendixes C and D. This approach provides a way to control for not only observed characteristics but also unobserved characteristics, in which everything shared between siblings that could otherwise bias the estimates will be neutralized. More specifically, this is accomplished through the parameter μ_{kf} representing the family fixed-effects, capturing time invariant characteristics common to all siblings within a given family. Lastly, ε_{kif} is an individual-specific error term.

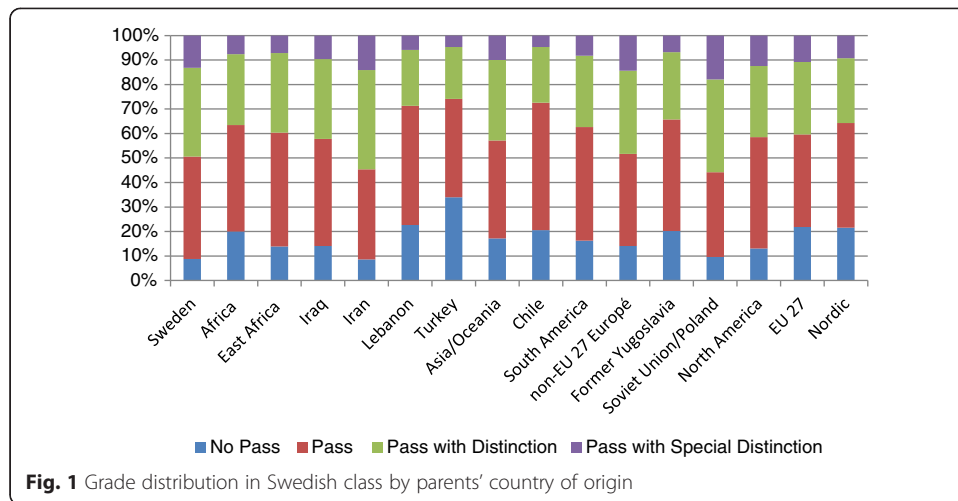
$$P(y_{if} = k) = \beta_k X_{kif} + \theta_k Z_{kif} + \mu_{kf} + \varepsilon_{kif} \quad (1)$$

The analysis is performed first on the aggregated non-Western and Western parents' country of origin groups to provide a general sense of the relationship between PYSM and children's academic performance. The same analyses are then conducted separately for each parents' country of origin group. This is linked to the lack of within-family variation on this measure, and also this allows us to estimate the effect of PYSM separately by parents' country of origin. The main disadvantage is that comparing coefficients between the groups becomes problematic. Therefore, we will primarily discuss differences between countries of origin in terms of the direction of the effect of parents' time in Sweden and only to a lesser extent compare the size of coefficients across models.

4 Results and discussion

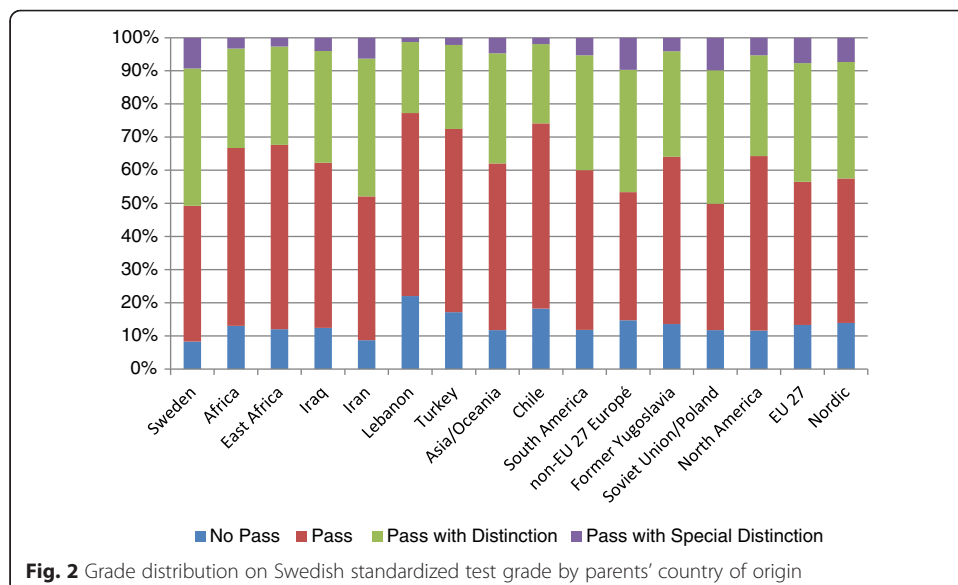
4.1 Sample characteristics

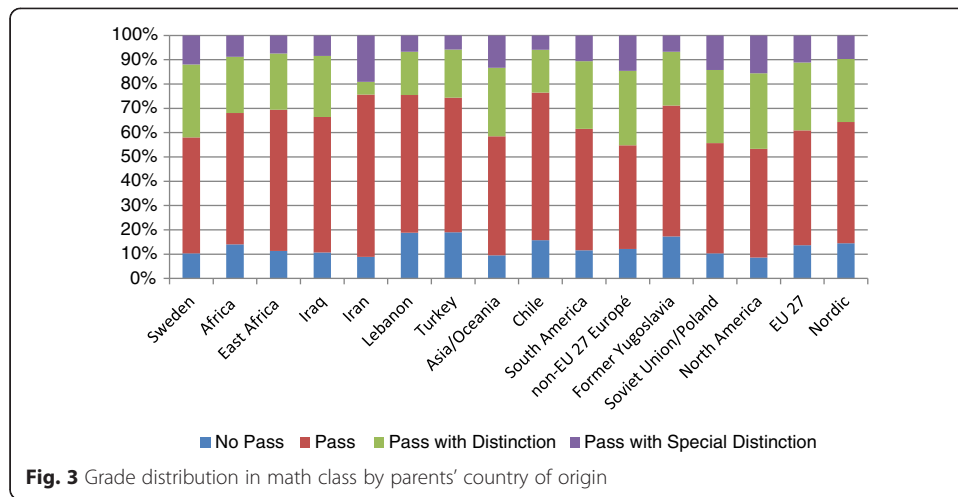
Figures 1-4 present the distribution of Swedish and math class grades and standardized test scores by parents' country of origin, with children of native-born Swedes included to serve as a point of reference. The distribution affirms what has been found elsewhere; second-generation immigrants, on average, have worse educational performance than natives, though this varies by parents' country of origin (Jonsson and Rudolphi 2011; OECD 2010). Namely, individuals whose parents were born in Iran, non-EU 27



Europe, the Soviet Union/Poland, North America, and EU-27 performed as well—if not better than—Swedes in Swedish and math. Otherwise, most immigrant groups perform below that of Swedes in these subjects. Across all groups, the educational performance of students breaks up so that 10–20 % fail, 30–40 % pass or pass with distinction, and another 5–10 % pass with the highest distinction, with some variation by parents' country of origin and subject/grade instrument.

Figure 5 shows the mean values of PYSM, as well as the within-family variation, by parents' country of origin for all graduating cohorts from 1989 to 2011. The variation in the average PYSM across parents' country of origin groups is considerable, with Africans, Chileans, and those from Eastern Europe as well as Western countries of origin displaying considerably higher values than those from other non-Western countries. However, the within-family variation, which technically represents the mean spacing between included births, is considerably smaller, with nearly all groups' mean value lying between 2 and 3 years. The relatively similar values are



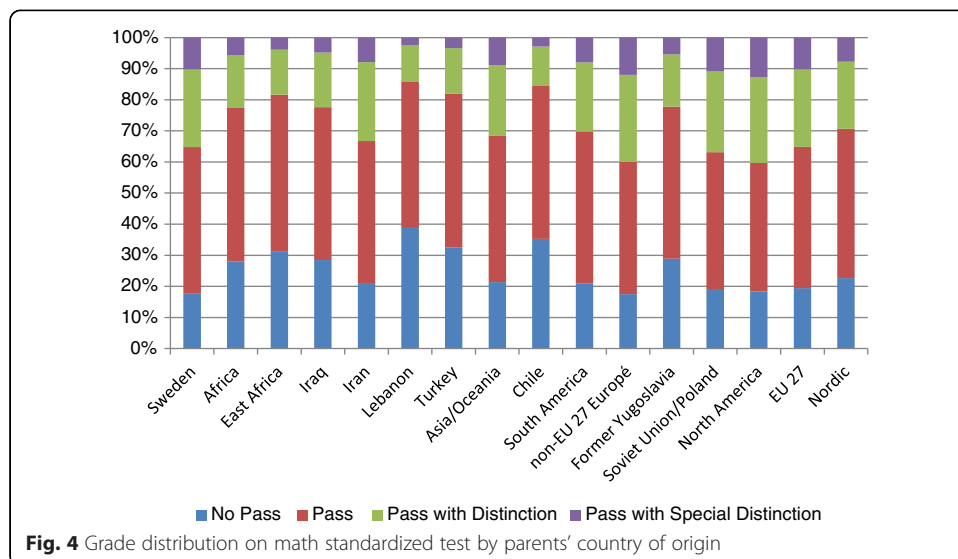


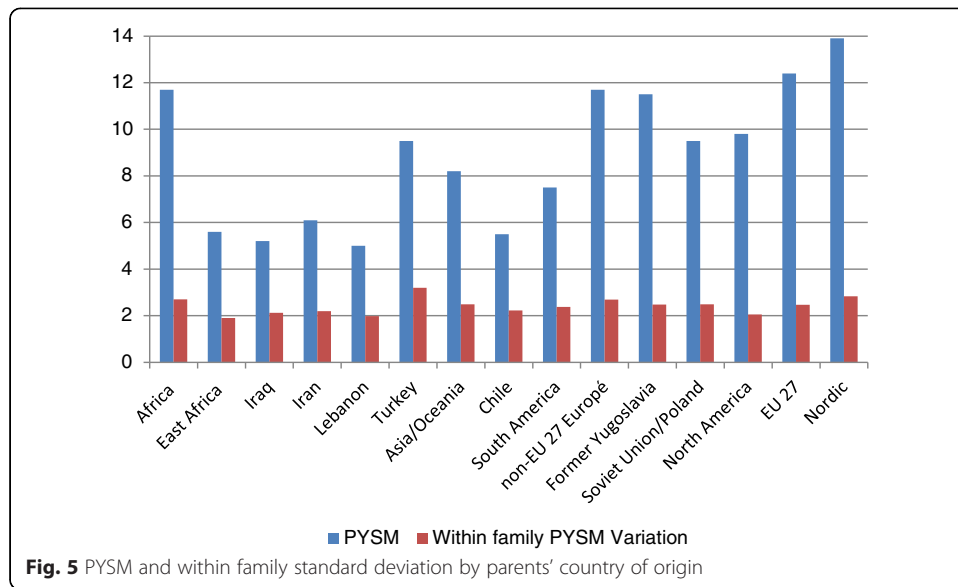
notable, as it appears immigrant parents from a wide range of backgrounds have a similar time frame for spacing between children and, thus, similar time frames for additional incorporation to occur between children.

4.2 Multinomial fixed-effects regression results

4.2.1 Aggregated results

Tables 1 and 2 present results from multinomial logistic regressions on class grade and standardized test scores in Swedish and math using family fixed-effects. These are stratified based on the individual's non-Western or Western background to provide a sense of the general relationship between PYSM and children's school performance as well as informing what is gained by using more detailed parents' country of origin data in subsequent analyses. These groups are considered separately due to their distinct characteristics and background as well as their levels of "successful" integration in Sweden, which may influence the potential relationship between PYSM and children's





academic performance. The non-Western origin group includes those whose parents come from Africa, East Africa, Iraq, Iran, Lebanon, Turkey, Asia/Oceania, Chile, and South America, while those whose parents come from non-EU-27 Europe, former Yugoslavia, former Russia and Poland, North America and EU-27, and other Nordic countries are categorized as coming from Western countries of origin. From this aggregated data, in Table 1, PYSM is seen to have a significant and positive effect on their children’s Swedish performance, which agrees with previous studies that have found that parents’ language proficiency, as measured by time in a host country, can influence children’s proficiency (Bleakley and Chin 2008; Casey and Dustmann 2008). This result points to the positive effect parents’ linguistic acculturation has on their children’s Swedish performance and, most likely, their overall proficiency as well.

Table 2 presents results on the effect of PYSM on math performance. The positive effect of PYSM on Swedish is not found in the relationship between PYSM and math performance. Instead, this relationship is characterized as neutral or even negative. Though there is a significant negative relationship between children’s math class grade and PYSM, the effect size is very small between the non-Western and Western groups,

Table 1 Results on effects of PYSM on Swedish performance with family fixed-effects (reference = “No Pass”)

| | Class grade | | Standardized test | |
|--------------------------------------------|--------------|--------------|-------------------|--------------|
| | Non-Western | Western | Non-Western | Western |
| Pass (std. error) | 1.21** (.01) | 1.08** (.01) | 1.26** (.04) | 1.16** (.06) |
| Pass with distinction (std. error) | 1.27** (.01) | 1.12** (.01) | 1.40** (.05) | 1.33** (.08) |
| Pass with special distinction (std. error) | 1.29** (.02) | 1.17** (.02) | 1.52** (.11) | 1.39** (.13) |
| Obs. | 30,259 | 31,410 | 11,037 | 5111 |
| Family obs. | 11,305 | 13,036 | 4911 | 2360 |
| Pseudo-R-squared | .10 | .14 | .06 | .09 |

Notes: In addition, each regression also includes control variables for sex and firstborn status

Source: SIP, 1989–2011

Exponentiated coefficients; standard errors in parentheses

**p < 0.01

Table 2 Results on effects of PYSM on math performance with family fixed-effects (reference = “No Pass”)

| | Class grade | | Standardized test | |
|--------------------------------------------|-------------|--------------|--------------------------|---------------|
| | Non-Western | Western | Non-Western | Western |
| Pass (std. error) | 0.99 (0.01) | 0.98* (0.01) | 0.96 ⁺ (0.02) | 0.94* (0.03) |
| Pass with distinction (std. error) | 0.99 (0.01) | 0.97* (0.01) | 0.90** (0.03) | 0.89** (0.04) |
| Pass with special distinction (std. error) | 1.01 (0.01) | 1.01 (0.01) | 0.91 ⁺ (0.04) | 0.87* (0.06) |
| Obs. | 28,282 | 30,987 | 13,389 | 6322 |
| Family obs. | 10,506 | 12,888 | 5850 | 2863 |
| Pseudo- <i>R</i> -squared | .03 | .05 | .01 | .02 |

Notes: In addition, each regression also includes control variables for sex and firstborn status

Source: SIP, 2005–2011

Exponentiated coefficients; standard errors in parentheses

⁺*p* < 0.10; ^{*}*p* < 0.05

suggesting that the two are unrelated. There is also a significant negative relationship between PYSM and children’s standardized math test performance but with an even stronger effect size. That this neutral or even negative relationship exists for both the “less successful” non-Western immigrants and “more successful” Western immigrants raises questions as to whether this is truly indicative of segmented assimilation, but rather evidence that the general effects of parents’ incorporation are insufficient to impact children’s math performance. We next investigate if this is a universal trend or if the relationship between PYSM and children’s school performance is heterogeneous by parents’ country of origin group.

4.2.2 Swedish

Tables 3 and 4 display results from multinomial logistic regressions on Swedish class grades and standardized test scores using family fixed-effects. These have been stratified by parents’ country of origin and include controls for sex, pre-/post-1998 class grade reform, and whether the respondent was the oldest sibling. The reference category for these analyses is “No Pass.” Parents’ additional time in Sweden has a generally positive effect on their performance in Swedish class grades and standardized test scores. The only group for whom PYSM does not increase their likelihood of passing are those that belong to non-EU-27 Europe. Secondary analyses using alternative grade reference categories (Pass, Pass with distinction, or Pass with highest distinction) show that, for many groups, the largest impact of PYSM is moving from “No Pass” to any of the higher grade categories and not necessarily between those higher-achieving grade categories, though some variation does exist (not shown). The intergenerational effect of parents’ incorporation on Swedish class performance across all immigrant groups, again, save the non-EU-27 Europeans, is one of assimilation.

Next, Table 4 displays the results from analysis on Swedish standardized test scores by parents’ country of origin. Data for standardized test scores is available from 2005 to 2011, and, as a result, the group sample sizes are reduced. Though most groups retain enough individual and family observations to get reasonably unbiased estimates, the non-EU-27 Europe group has less than 100 family observations, too few for the family fixed-effects methodology, so they are omitted from the Swedish and math standardized test analyses. The results from the standardized grade analysis are similar to that of the course grade analysis by parents’ country of origin. Again, there is almost a universally positive

Table 3 Results on effects of PYSM on Swedish course grade performance with family fixed-effects (reference = "No Pass")

| | Pass (std. error) | Pass with distinction (std. error) | Pass with special distinction (std. error) | Obs. | Family obs. | Pseudo- R^2 |
|--------------------------------|-------------------|------------------------------------|--------------------------------------------|--------|-------------|---------------|
| Africa | 1.20** (.04) | 1.21** (.04) | 1.24** (.06) | 2357 | 847 | .10 |
| East Africa | 1.15** (.05) | 1.21** (.06) | 1.15 ⁺ (.08) | 1912 | 774 | .07 |
| Iraq | 1.23** (.05) | 1.30** (.06) | 1.33** (.09) | 1367 | 578 | .11 |
| Iran | 1.25** (.08) | 1.32** (.08) | 1.24* (.09) | 1588 | 737 | .11 |
| Lebanon | 1.30** (.04) | 1.34** (.05) | 1.30** (.07) | 2790 | 1038 | .09 |
| Turkey | 1.21** (.02) | 1.29** (.02) | 1.31** (.03) | 9217 | 3081 | .12 |
| Asia/Oceania | 1.21** (.02) | 1.26** (.03) | 1.30** (.03) | 8546 | 3175 | .08 |
| Chile | 1.15** (.04) | 1.16** (.06) | 1.30** (.10) | 1698 | 739 | .10 |
| South America | 1.16* (.07) | 1.25** (.09) | 1.30* (.13) | 784 | 336 | .13 |
| Non-EU-27 Europe | 0.97 (.08) | 0.90 (.08) | 1.05 (.10) | 591 | 248 | .18 |
| Former Yugoslavia | 1.07** (.03) | 1.15** (.03) | 1.15** (.05) | 6075 | 2617 | .13 |
| Former Soviet Union/ Poland | 1.14* (.06) | 1.18** (.07) | 1.26** (.07) | 2223 | 986 | .11 |
| EU-27 and North America | 1.09** (.03) | 1.13** (.03) | 1.19** (.05) | 5055 | 2143 | .11 |
| Nordic | 1.08** (.01) | 1.11** (.04) | 1.17** (.02) | 17,466 | 7042 | .16 |

Notes: In addition, each regression also includes control variables for sex and firstborn status

Source: SIP, 1989–2011

Exponentiated coefficients; standard errors in parentheses

⁺ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$

Table 4 Results on effects of PYSM on Swedish standardized test performance with family fixed-effects (reference = "No Pass")

| | Pass (std. error) | Pass with distinction (std. error) | Pass with special distinction (std. error) | Obs. | Family obs. | Pseudo- R^2 |
|--------------------------------|----------------------------|------------------------------------|--------------------------------------------|------|-------------|---------------|
| Africa | 1.80** (.29) | 1.83** (.33) | 1.50 (.44) | 777 | 346 | .13 |
| East Africa | 1.29* (.15) | 1.48** (.20) | 1.66 ⁺ (.46) | 1179 | 514 | .07 |
| Iraq | 1.08 (.15) | 1.31 ⁺ (.21) | 1.07 (.30) | 718 | 338 | .13 |
| Iran | 1.74** (.33) | 1.64* (.32) | 1.70 ⁺ (.48) | 707 | 343 | .10 |
| Lebanon | 1.23** (.09) | 1.51** (.14) | 1.17 (.31) | 1700 | 709 | .05 |
| Turkey | 1.20* (.09) | 1.42** (.13) | 1.53 (.31) | 1766 | 802 | .06 |
| Asia/Oceania | 1.29** (.08) | 1.38** (.10) | 1.66** (.10) | 3354 | 1466 | .07 |
| Chile | 1.21 ⁺ (.14) | 1.33 ⁺ (.19) | 2.95 (2.14) | 610 | 285 | .07 |
| South America | 1.13 (.30) | 1.25 (.36) | 1.21 (.71) | 226 | 108 | .16 |
| Non-EU-27 Europe | Omitted due to sample size | | | | | |
| Former Yugoslavia | 1.44** (.17) | 1.58** (.21) | 1.19 (.30) | 1314 | 613 | .09 |
| Former Soviet Union/ Poland | 1.52 ⁺ (.34) | 1.85* (.47) | 1.73 (.59) | 487 | 232 | .14 |
| EU-27 and North America | 0.97 (.12) | 1.16 (.15) | 1.35 ⁺ (.25) | 1018 | 462 | .07 |
| Nordic | 1.13 (.09) | 1.26* (.06) | 1.43* (.20) | 2193 | 1006 | .11 |

Notes: In addition, each regression also includes control variables for sex and firstborn status

Source: SIP, 2005–2011

Exponentiated coefficients; standard errors in parentheses

⁺ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$

and significant relationship between PYSM and children's Swedish performance, particularly in moving from "No Pass" to "Pass" or "Pass with distinction." That parents' time in Sweden is positive and significant for both course grades and standardized test scores in Swedish is interesting as course grades tend to reward behavioral attributes while standardized tests reward subject mastery. Despite prioritizing different attributes, parents' time in Sweden has a positive relationship with both grading instruments. Further, this positive relationship exists across nearly all immigrant groups, showing that linguistic acculturation is pervasive and important in developing and assisting children's language proficiency and performance in Swedish class/test. If these families were undergoing a process of dissonant acculturation, in which children learn the host country language faster than the parents, the relationship between PYSM and children's Swedish performance would be much weaker. Instead, this positive relationship holds true, even among those families from non-Western countries of origin who come from the most linguistically and culturally distinct locations and for whom incorporation has been most contested.

4.2.3 Math

Tables 5 and 6 present results from multinomial regressions on math class grades and standardized test score using family fixed-effects. These results show a starkly different trend than the Swedish results. Instead of having an effect in line with assimilation theory, there is a neutral relationship between math performance and PYSM, regardless of parents' country of origin and across all grade categories and assessment instruments. There is seemingly no effect of incorporation as measured by PYSM on performance in math. This lack of a relationship indicates that the potentially general effects from

Table 5 Results on effects of PYSM on math course grade performance with family fixed-effects (reference = "No Pass")

| | Pass (std. error) | Pass with distinction (std. error) | Pass with special distinction (std. error) | Obs. | Family obs. | Pseudo- R^2 |
|----------------------------|-------------------------|------------------------------------|--------------------------------------------|--------|-------------|---------------|
| Africa | 0.99 (.03) | 1.00 (.04) | 0.97 (.05) | 2067 | 746 | .02 |
| East Africa | 0.95 (.04) | 0.91 ⁺ (.05) | 0.93 (.07) | 1671 | 681 | .03 |
| Iraq | 0.98 (.04) | 0.96 (.05) | 0.96 (.07) | 1233 | 526 | .02 |
| Iran | 0.99 (.07) | 0.99 (.08) | 1.10 (.10) | 1378 | 646 | .02 |
| Lebanon | 0.98 (.03) | 0.99 (.04) | 1.01 (.05) | 2572 | 956 | .02 |
| Turkey | 1.00 (.01) | 1.01 (.02) | 1.02 (.02) | 9181 | 3049 | .05 |
| Asia/Oceania | 1.02 (.02) | 1.00 (.02) | 1.04 (.03) | 7971 | 2958 | .03 |
| Chile | 0.90** (.03) | 0.92 (.05) | 0.87 ⁺ (.07) | 1480 | 640 | .05 |
| South America | 0.95 (.06) | 0.98 (.07) | 0.96 (.10) | 729 | 304 | .06 |
| Non-EU-27 Europe | 0.90 (.07) | 0.88 (.07) | 1.04 (.09) | 576 | 243 | .10 |
| Former Yugoslavia | 0.96 ⁺ (.02) | 0.98 (.03) | 1.02 (.04) | 5848 | 2531 | .06 |
| Former Soviet Union/Poland | 0.97 (.05) | 0.94 (.05) | 1.00 (.06) | 2154 | 952 | .05 |
| EU-27 and North America | 0.98 (.03) | 0.99 (.03) | 1.03 (.04) | 5014 | 2134 | .05 |
| Nordic | 0.98 (.01) | 0.98 ⁺ (.01) | 0.99 (.02) | 17,395 | 7028 | .05 |

Notes: In addition, each regression also includes control variables for sex and firstborn status

Source: SIP, 1989–2011

Exponentiated coefficients; standard errors in parentheses

⁺ $p < 0.10$; ^{**} $p < 0.01$

Table 6 Results on effects of PYSM on math standardized test performance with family fixed-effects (reference = "No Pass")

| | Pass (std. error) | Pass with distinction (std. error) | Pass with special distinction (std. error) | Obs. | Family obs. | Pseudo- R^2 |
|--------------------------------|----------------------------|------------------------------------|--------------------------------------------|------|-------------|---------------|
| Africa | 0.89* (.04) | 0.87 ⁺ (.07) | 1.04 (.17) | 937 | 402 | .02 |
| East Africa | 1.02 (.05) | 0.95 (.08) | 1.12 (.17) | 1359 | 584 | .02 |
| Iraq | 1.01 (.06) | 0.95 (.09) | 0.76 (.13) | 808 | 371 | .02 |
| Iran | 0.90 (.06) | 0.93 (.08) | 0.98 (.15) | 894 | 433 | .04 |
| Lebanon | 0.98 (.03) | 0.97 (.06) | 0.90 (.13) | 1894 | 774 | .01 |
| Turkey | 1.04 (.03) | 0.99 (.04) | 0.92 (.07) | 2377 | 1047 | .01 |
| Asia/Oceania | 1.01 (.03) | 0.94 (.04) | 0.94 (.05) | 4052 | 1748 | .02 |
| Chile | 0.98 (.05) | 0.83 ⁺ (.08) | 0.90 (.18) | 814 | 371 | .06 |
| South America | 0.87 (.12) | 1.18 (.23) | 0.87 (.30) | 254 | 120 | .09 |
| Non-EU-27 Europe | Omitted due to sample size | | | | | |
| Former Yugoslavia | 0.94 (.05) | 0.92 (.07) | 0.74* (.10) | 1574 | 723 | .02 |
| Former Soviet Union/ Poland | 1.01 (.11) | 0.88 (.12) | 0.98 (.17) | 627 | 293 | .04 |
| EU-27 and North America | 0.97 (.07) | 0.96 (.10) | 0.89 (.12) | 1216 | 548 | .03 |
| Nordic | 0.94 ⁺ (.03) | 0.90* (.04) | 0.89 ⁺ (.06) | 2789 | 1246 | .03 |

Notes: In addition, each regression also includes control variables for sex and firstborn status

Source: SIP, 2005–2011

Exponentiated coefficients; standard errors in parentheses

⁺ $p < 0.10$; * $p < 0.05$

parents' incorporation, such as increased familiarity with the school system or social capital, are insufficient to increase their children's performance in math. Although a pattern of assimilation is not present, the unanimous lack of an effect of PYSM on children's math performance does not necessarily mean this is the result of downward assimilation. Instead, as parents' math skills are unexpected to be influenced as a direct result of immigrating, this result indicates that the general effects of parents' incorporation have little to no consequence on school performance.

5 Conclusions

The results on Swedish class grade performance show evidence of assimilation across all immigrant groups. This result provides additional support for the relationship between parents' language ability and children's language performance (Casey and Dustmann 2008; Bleakley and Chin 2008) but using a more causal approach across a broader range of immigrant groups than has previously been considered elsewhere. One might expect children's school performance to improve as a result of parents' language proficiency and their general willingness and ability to become involved in their children's education. By focusing on just Swedish grades, however, it is impossible to say whether this is the result of language acculturation alone or in combination with other general effects of parents' incorporation. By looking at math grades, for which parents' Swedish-specific skill may not be as important and not so directly transferable, we attempt to get a better idea of the role of general mechanisms of incorporation. The results from the math analyses show no relationship between PYSM and math performance for any country of origin group, suggesting that the general effects of parents' incorporation are not sufficient to impact their children's math performance. This

constellation of results suggests that parents' time in Sweden does have an impact on their children's educational performance but in specific rather than general ways. Areas that children benefit the most from parents' experiences are those that are more directly transferable, namely language proficiency. Although no positive relationship is found between PYSM and math performance, this would not necessarily suggest evidence of downward assimilation or ethnic disadvantage. Instead, the overall lack of a positive relationship between PYSM and math grades leads us to conclude that parents' incorporation has no effect in a course which requires little Swedish-specific skills.

Although the results, in principle, show a high degree of homogeneity in the relationship between PYSM and Swedish and math performance by parents' country of origin, this is an important fact to establish on the topic of immigrant incorporation. This paper demonstrates that, irrespective of country of origin, parents develop linguistic proficiency that then helps to increase their children's Swedish performance. However, it is unable to influence performance in a less Swedish-specific subject, math. That this relationship is homogenous is notable, considering the range of sending contexts and the changing context within Sweden that immigrants have encountered over the last half century. Our analysis agrees with previous research (Åslund et al. 2009; Nielsen and Rangvid 2012) that has found that PYSM is a useful measure to capture the intergenerational transmission of incorporation experiences, specifically, linguistic acculturation. Although our research shows that there is a positive effect of PYSM on the Swedish grade and test scores of second-generation immigrants from non-Western countries of origin, the low levels of PYSM found among these groups may contribute to their underperformance in Swedish relative the native population. These low levels of PYSM are the result of immigrants from non-Western origins arriving in adulthood at a much greater rate than those from European or North American countries, combined with earlier childbearing norms. As a result, many non-Western second-generation immigrants are born into households with parents whose incorporation experiences are often limited, even if what is accrued is transmitted to their children.

Following previous research (Nielsen and Rangvid 2012), we tested for differences by parents' gender, which yielded no differences. Additionally, we included interactions between PYSM and sex of the individual, but it does not appear that parents' time in Sweden affects brothers and sisters differently. We further stratified by parents' highest educational attainment, which provided unclear results, even when considered by parents' country of origin or Western/non-Western backgrounds. We additionally ran models that included a $PYSM^2$ term, since the impact of PYSM could diminish with time, but the variable itself was not significant and it had little impact on the PYSM term. Additionally, given the research on first-generation immigrants that stressed that those arriving early had the best outcomes, we stratified by whether the parent was a child immigrant (arrived before age 12) or not, but the relationships between grades and PYSM remained regardless of when they arrived. We also stratified analyses by family size (Additional file 1: Appendix B) across the samples, and the results are consistent. Finally, Sweden offers two language classes, a standard Swedish class and a Swedish as a second language class (SSL). The relationship between PYSM and children's Swedish grade remains robust regardless if looking at those families with no children in SSL classes, all children in SSL classes, or at least one child in a standard Swedish class and one in an SSL class.

Although this study improves upon previous research by using a well-suited causal approach to look at the relationship between parents' time in Sweden on their children's educational performance by a more diverse country of origin group over a broader time frame than has previously been done, certain weaknesses exist. As was previously mentioned, the external validity to families with one child is unknowable using this approach. Although this includes a minority of the sample, it is nonetheless a weakness. Additionally, we exclude those with one foreign-born and one native-born parent, which make up a majority of second-generation immigrants from Western countries of origin. We consider here performance in two subjects, and though these were selected for specific purposes, it is uncertain whether the relationship between parents' time in Sweden and children's performance found here is representative for all non-language courses, or whether math might represent an outlier. Areas left to be explored include looking at a broader range of courses that might provide alternative testing grounds for the relationship between PYSM and children's performance. Although results from this paper have stressed the role of language acculturation, and children of mixed marriages inherently have a fluent speaker already in the household, there may be some value to consider children who are born into mixed families. Finally, this paper looks at the role of PYSM in academic performance just before the age that tracking takes place in Sweden. Because Swedish students have more choice in the secondary school program they undertake, conditioned on performance, than is found elsewhere (Jonsson and Rudolphi 2011; Jackson et al. 2012), it is worth asking if parents' time in Sweden has an effect on this decision, above and beyond its effect on school performance.

Additional file

Additional file 1: Appendix A: Descriptive statistics of multi-child sample by parents' country of origin, 1989-2011.
Appendix B: Results on effects of PYSM on Swedish performance with family fixed-effects by family size (reference="No Pass"). **Appendix C:** Characteristics of those included in Swedish analyses versus not.
Appendix D: Logistic regression on inclusion in Swedish national test/class grades analyses. (DOCX 25.7 kb)

Competing interests

The IZA Journal of Migration is committed to the IZA Guiding Principles of Research Integrity. The authors declare that they have observed these principles.

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