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ABSTRACT

Parents and Children Talk: The Family Dynamics of English Language Proficiency*

This paper extends the analysis of the acquisition of destination language proficiency among immigrants by explicitly incorporating dynamics among family members – mother, father and children. Single equation, bivariate, and four-state (multivariate) probit analyses are employed. Immigrant English language skills are greater the younger the age at migration, the longer the duration of residence, the higher the level of education, and for immigrants not from Asia. Large positive correlations in the unmeasured determinants of proficiency exist between spouses, between siblings, and between parents and children, although the latter relationship is stronger for the mother.

JEL Classification: J15, J16, J24, J61

Keywords: immigrants, language, family, multinominal probit

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I. INTRODUCTION

The tradition in migration research has been to emphasize the individual as the decision maker. In this approach family membership is held implicitly or explicitly to be inconsequential in terms of explaining a given individual's behavior. There is, however, a stream of research emphasizing the role of the family in migration decisions. Mincer (1978) argued that migration decisions are based on the net economic opportunities open to both the primary income earner (generally the husband), and the secondary income earner (often females). Migration to where the joint opportunities are better will occur, even if each spouse has better opportunities elsewhere. More recent research has widened the scope of the family ties considered in migration decision making to be more consistent with the characteristics of recent international migration flows. In a series of theoretical models, Stark (1991) shows how family interactions may influence the migration decisions. These interactions include risk sharing. Hatton and Williamson (1997), in their *The Age of Mass Migration*, demonstrate how chain migration and the formation of immigrant enclaves influenced 19th century trans-Atlantic migration. For the more modern era, Dejong, Root and Abad (1986) find that the number of Filipinos entering the U.S. under occupational preference categories declined during the period of the 1970s to the early 1980s, but an increasing number of immigrants have been able to enter utilizing family network ties. Their survey data also show that a high proportion of immigrants not only already have immediate family members in the U.S. but also plan to move with other family members and expect additional relatives to follow. Meredith and Rowe (1986) observe that even refugees, after their first reception, tend to move to areas in the destination where their relatives are located.

This theme of focusing on the family as the unit of analysis has been developed to explain some post-migration behavior. Baker and Benjamin (1997), for example, develop a family investment model wherein one spouse (generally the wife) will work extensively in the immediate post-migration period in order to finance the human capital investment of another family member (generally the husband). Birrell (1987, p.110) notes that some immigrant groups "anxious for success and bringing with them strong traditions of family solidarity, were keen to motivate their children", and that this explained the high levels of education of some children of immigrants of non-English speaking background.

An area of research that illustrates the greater focus on the family as an influence on post-migration outcomes is the study of dominant language skills. Learning a new language presents many difficulties for some immigrants and for their children.[1] Yet the research has shown that immigrants with dominant language fluency have labor market and other outcomes superior to those of immigrants with limited dominant language skills.[2]

Formal models of the dominant language acquisition process have been developed (see, for example, Breton (1978a)(1978b), Chiswick and Miller (1998)(2001) and the references therein, and Espenshade and Fu (1997)). Empirical testing of these models yields strong support for the main hypotheses advanced. In

[1] In analyzing Italian migration between 1876 and 1913, Moretti (1999) notes that immigrants knew nothing of the language of the country of destination. It is the provision of help from relatives and friends who were already living overseas that enabled immigrants to settle more quickly after arrival in the destination.

[2] For evidence on the strong links between language skills and earnings in several countries, in particular, the U.S., Canada, Australia, Germany, and Israel, see Chiswick and Miller (1992)(1995) and the references therein. The evidence on the links between dominant language proficiency and social and emotional adjustment, however, is not so compelling (see Aronowitz (1984), Nauck (1989)). For example, Nauck (1989, p.35) notes that "In comparison with dimensions of structural and social assimilation, participation in cultural opportunities has found little recognition in

particular, it has been demonstrated in studies for a number of countries in different time periods with different destination languages and analyzing different dimensions of language (speaking, reading, writing) that immigration at an older age is associated with lower proficiency in the destination language, while destination language skills are greater the longer the duration in the host country and among the better educated. Language skills have also been shown to vary negatively with the "linguistic distance" between the immigrant's mother tongue and the destination language, with the propensity for return migration, and with refugee status. It varies positively with the degree of favorable selectivity in migration, and with exposure to the destination language in the origin. The characteristics of the immigrant's region of residence also impact on their destination language skills, with greater access to the immigrant's mother tongue in the region in which the immigrant lives being associated with poorer destination language skills.

At the same time, the language adaptation of the children of immigrants has been researched. In analyzing the language adaptation of second-generation immigrants raised in Miami, Florida, Portes and Schauffler (1994) find that the passage of time in the country strongly influences linguistic adjustment, leading to a rapid shift toward English.[3] These authors also point out that only in places where immigrant groups concentrate and manage to sustain a diversified economic and cultural presence will their language survive past the immigrant generation.

To date, with the exception of Chiswick, Lee and Miller (forthcoming), research into dominant language skills has been conducted separately for individuals

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research on assimilation; only language acquisition, which has to be looked at as the major condition of cultural assimilation, has come into the focus of this research".

[3] This applies to children born in the U.S. with at least one foreign-born parent or children born abroad who had lived in the U.S. for at least five years.

(*e.g.*, adult males, adult females, children) within the typical family. Chiswick *et al.* (forthcoming) provide a framework that enables these relationships among members of the family unit to be quantified. Focusing on spouses, they show that there is a positive correlation between the personal characteristics within migrating units, presumably as a result of positive assortative mating, and a strong commonality of other demographic characteristics (*e.g.*, birthplace, location in the destination, duration in the destination) and institutional characteristics (*e.g.*, visa category) as a result of the migration process. These commonalities combine with the similarity of the processes determining the English language skills of family members and interactions among spouses within the household to generate strong links between the destination language skills of spouses.

The model of English-speaking skills estimated by Chiswick *et al.* (forthcoming) for immigrant families in Australia suggests that in addition to measured factors, there are other factors that need to be considered, and which reinforce the tendency for the English-speaking skills of spouses to be similar. It was found that there is a sizeable positive correlation between the disturbance terms in the models estimated separately for spouses in each migrating unit. The disturbance or error term captures the impacts of the range of factors that cannot be measured for inclusion in the model, such as motivation, aptitude for the learning of languages, and the degree of family interactions. This means that in cases where there are unobservables that lead one person to have greater (lesser) English speaking skills than predicted by the model, then the same or other unobservables will also result in their spouses having greater (lesser) English speaking skills than predicted by the model. It is possible that there is positive assortative mating on the basis of the unmeasured dimensions of language skills. It is also possible that the positive correlation reflects spouses learning from each other. Such interactions in the household are important, and are also shown to lead to differential effects of the presence of children on the dominant language skills of adult males and females. The presence of children in the family has a less positive or more negative effect on their mother's language skills than that of their father's.

Unfortunately, the Chiswick *et al*. (forthcoming) study is limited in several regards. It is based on a relatively small survey and examined immigrants in Australia only 5 or 6 months. It could therefore not examine the role of duration. Moreover, it focused exclusively on the proficiency of husbands and wives, ignoring the proficiency of children and the interactions between and among mothers, fathers, children and siblings.

This study advances on the previous streams of research by simultaneously considering the links among the dominant language skills of mothers, fathers, their children and sibling relationships among the children. It does this by treating the entire family as the unit of observation. The aims are primarily to establish links between and among the language skills of children and of their parents, and to ascertain whether these links vary according to offspring birth order and the age of the children, among other factors. The data under study are the unit record files from the 1996 Australian Census of Population and Housing, which provides a very large sample size and immigrants of all durations in the country.

The structure of the paper is as follows. Section II provides a brief introduction to the literature analyzing dynamics within immigrant families in the post-migration period. Section III contains an overview of the Census data. This includes a discussion of the limitations of using de facto family membership as the underlying categorization. Separate analyses are conducted in Section IV examining the linkages between the language skills of spouses, and examining the linkages among the language skills of parents and children. Section V contains a summary and discussion.

II. BACKGROUND

Enloe and Lewin (1987) argue that migration affects family members differently, and these effects vary according to the position within the family. Three sets of relationships within the family can be identified, namely the husband-wife relationship, the parent-child relationship and the relationship among siblings (see Dumon (1989)).

(a) The husband-wife relationship

The husband-wife relationship has been emphasized in recent studies of both migration decisions (*e.g.*, Mincer (1978)) and post-migration behavior (*e.g.*, Baker and Benjamin (1997)). Key elements of this relationship appear to have changed in recent years. For example, Gavaki (1979), in describing the Greek family both in Greece and Canada, shows that the traditional patterns of family-gender roles have undergone considerable transition. In particular, the fathers/husbands' authority has been reduced, whereas mothers/wives' involvement in decision-making processes has increased. Presumably this transition reflects in large part the wider set of social and institutional changes that have occurred in many Western countries. The formal modeling of the acquisition of dominant language skills outlined in Chiswick, Lee and Miller (forthcoming) is sensitive to these changes, and follows the development of the labor supply literature. Thus, in research on labor supply, the approach to modeling has moved from a male decision making model to a family decision making model (see Killingsworth (1983)).

(b) The parent-child relationship

Children have greater exposure to the language and culture of the host country. Among other factors, they receive intense exposure to the dominant language while at school. Being younger, they also are able to learn new languages quicker than their parents (see Long (1990), Service and Clark (1993)). Thus, it is to be expected that children would acquire proficiency more rapidly then their parents.

Four main factors appear to impact on the relationship between children and their parents in the evolution of dominant language proficiency in the family. On the negative side, these are: (i) the children as interpreters factor, where children are encouraged to acquire dominant language skills so that they can help insulate their parents from the host country (see, for example, Ziegler (1977)[4]); (ii) the desire among some parents to have their children learn/retain the language and culture of the origin country to enable communication with parents and grandparents, and possibly to facilitate visits or return migration; (iii) children lower mother's labor supply, which results in a lower exposure to the destination language and a lower economic incentive for the mother to learn this language. On the positive side, (iv) the children as teachers factor, whereby children bring the dominant language into the home and encourage its use.[5]

Of the four sets of influence outlined above, only the last hypothesis, that is, "children as teachers", suggests a positive effect of children on parents' destination language proficiency; the others imply a negative effect. The "children as interpreters" and the "labor supply effects" hypotheses are more likely to depress the

[4] Ziegler (1977, p.330) notes "…many parents expected their children to learn English for them, because they felt too old to learn."

[5] The typical Israeli myth in the period of mass immigration following independence was that the parents would learn Hebrew from their children.

mother's language proficiency than that of the father's. If as argued by Dumon (1989) mothers are primarily responsible for the socialization of their children, the links between the characteristics of the mothers and their children's language skills will be stronger than that of the father. These effects on immigrant parents and their children's bilingualism may vary according to socio-economic factors. Portes and Schauffler (1994) note that better educated parents tend to wish to transmit their mother tongue, but will also be more proficient in the destination language and make available more opportunities for their children to enter the destination's cultural mainstream.

The parent-child relationship can be further analyzed according to different periods in the life cycle.

(i) Early childhood

A number of studies (*e.g.*, Nauck (1988)) have shown that the parent-child relationship varies with socio-economic status. This may have implications for dominant language acquisition. For example, better-educated parents are more likely to choose formal childcare when their children are very young. This may result in greater exposure to the dominant language from an early age, and the literature (*e.g.* Chiswick and Miller (1998)) shows that post-migration exposure is an important influence on levels of fluency.

(ii) Pre-school and school-age children

Immigrant children usually face a norm and value system at home which is different from the norm and value system they experience in the school systems of host countries. Moreover, Hirschman (1994, p.703) notes that "the youngest immigrants may also be more susceptible to peer pressures that are at odds with influences from the home". The impact of this inconsistency on dominant language fluency will depend on the extent to which the parents are oriented to adapting to the host country, and the extent to which the immigrant child interacts with other children of the same origin.

(iii) Adolescence

The period of puberty is often viewed as the launching stage in the family with potential for conflict. Studies such as Wakil, Siddique and Wakil (1981) and Sung (1985) point out that immigrant parents often see their children's ambivalence and 'novel ideas' as indication of disrespect and eventual rejection of their values and customs. Haines, Rutherford and Thomas (1981) note that disagreements between generations often arise as a result of children acculturating more rapidly than their parents to a society that places different values on many aspects of life, including the premium placed on youth. Naidoo and Davis (1988), for example, identify a generation gap between parents and teenage children as contributing to conflicts with regard to dating for adolescents. While this period is presumably the main period where bilingualism may turn to (practical) dominant language monolingualism, the empirical relevance of this suggestion does not appear to have been tested.

(c) The relationship among siblings

Research on the relationships among siblings is not as abundant as research on husband-wife or parent-child relationships. As shown by Blake (1980), among others, the greater the number of siblings the smaller the interaction of any one child with the parents, and the greater the interaction with other children (siblings). Among the native born this shift from parental to children interaction would lower the accumulation of human capital relevant for the country of residence. The picture is less clear for immigrant children and may depend on birth order. The oldest child of immigrant parents may be at the greatest disadvantage, while the youngest child, other things the same, has more assimilated parents and, perhaps more important, older siblings who may have already acquired destination-specific skills, including language proficiency.

Literature on the relationships among siblings in immigrant households tends to focus on Asian families. For example, in a study of family ties among Vietnamese refugees in the US, Haines *et al*. (1981) indicate the importance of sibling ties. Their study reveals clear indications that these sibling ties are permanent and frequently acknowledged in action. In the same study, it is reported that with proximity the sibling ties can be the basis for extensive mutual cooperation, as in business partnerships. Haines *et al*. (1981) quote an interviewee on the importance to him of his brother's partnership in the business (p.318) "…Even if he were offered more money he would not leave the family business … he helped me start the business". In another interview in the same study, a woman provided a complete update on all her siblings, including a critique of her sister's ideas on child rearing. She lives and cooperates with her sister and brother-in-law in a business venture. The importance of sibling ties would lead us to expect that these sibling ties would spill over to commonalities in dominant language skill development and mother tongue retention.

III. CENSUS DATA

The empirical analyses presented below are based on the 1996 Australian Census of Population and Housing Household Sample File (HSF). These census data are released in the form of a hierarchical file. Thus, information is available on each family within a household, and for each individual within a family. This information can be linked as required for analysis. Thus, the individual information for one person within a family can be merged with the information for another person or persons within the same family. This information can, in turn, be linked with overall characteristics of the family and the household. For example, information on both partners in a married couple can be linked together so that their language skills can be compared. The influence of other characteristics of the partners on their language skills can be determined to the extent that they are collected in the Census. The data compiled in this way enable the husband-wife relationship to be documented in terms of its impact on English language skills. Similarly, information on children living at home can be combined with the information on one or both parents to permit quantification of the parent-child relationship in dominant language acquisition.

This Household Sample File (HSF) contains a one percent sample of the 1996 Census data. It includes information from 76,533 Private and Non-Private Dwellings, 68,782 Families within Private Dwellings and 178,198 persons in Private and Non-Private Dwellings. The HSF contains information on age, gender, marital status, birthplace, duration in the country, employment status, educational qualification/attainment, occupation, region of residence and relationships in households, and, of primary importance for this study, language spoken at home and English language proficiency, among other variables.[6]

The main language question identifies any languages other than or in addition to English spoken at home. The languages and groups of languages most likely to be used in Australia are separately identified. Another language variable available in the HSF data, known as the Proficiency in English language variable, was limited to people who indicate that they speak a language at home other than or in addition to English. These people are asked to state how well they speak English. Four categories were identified: very well, well, not well, and not at all. Individuals in the first

[6] For those who speak only English at home there are no data on whether they know, or in other contexts speak, another language.

category, (speaks very well), together with those who speak English only, are categorized as "Proficient in English" in the analyses that follow. This is the categorization proposed by Chiswick and Miller (1995, p.253), based on the links between earnings and the various English language proficiency categories and on documentation from the Australian Bureau of Statistics on the likely practical language skills of members of the separate language proficiency categories.[7]

There is one limitation to these data. The detailed information on spouses or on children exist only for those family members resident in the household on Census night. For the study of the language skills of spouses, this might be only a minor limitation, except for spouses living apart. It will be a more serious limitation in the study of the parent-child relationship where there are older children who have left home, and where there are dependent children away at school or who are still in the origin.[8]

IV. EMPIRICAL ANALYSIS

Three separate sets of analyses are presented in detail, namely husband-wife relationship, father-eldest child relationship, and father-youngest child relationship. In the analysis for husband and wife in a family unit, the sample is restricted to opposite-

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[7] Similarly, for the US, Kominski (1989), on the basis of data from "test censuses" conducted by the US Census Bureau, argued that the use of two English skills categories in place of the four reported in the US Census (which are similar to those used in the Australian Census) is supported by the absence of clear differentiation between each of the four levels of English-speaking ability.

[8] Jensen and Chitose (1994, p.717) note that "… the corresponding focus only on those children still residing with their parents, imposes an inevitable selectivity problem. To the extent that there are systematic differences between second- and higher-generation children in the rate at which and reasons for which they leave their families of orientation, these comparisons are biased. We neither assess the magnitude nor attempt to correct for this bias, but raise this caveat to both caution the reader and to underscore the need to complement our analysis with primary data to provide a more complete picture of the status of the second generation."

sex adults who were both aged 20-64 years and who were both born overseas in non-English speaking countries. The analyses for both father-eldest child and father-youngest child relationships are limited to pairs where the fathers were between 20 and 64 years old and were born overseas in non-English speaking countries. Parallel analyses are also conducted for mother-offspring combinations. As the results for the parent-offspring analyses are largely invariant with regards to the parent's gender, the findings from the study of mothers and their children are presented only in summary form. In each instance, the sample used represents the maximum data available for the particular family members under analysis. Hence, the sample size for the father-eldest child analysis will differ from the sample size for the mother-eldest child analysis owing to missing values for either the mother or father. To illustrate the general features of the data, Appendix Table A1 lists means and standard deviations of the dependent and explanatory variables used in the first set of analyses for husband and wife.

This section begins with a discussion of simple cross-tabulations of English language proficiency between spouses and between parents and the oldest (and only) child and the youngest child. It continues with a series of bivariate probit analyses between spouses and between parents and the oldest (and only) child and the youngest child. It concludes with a four-state probit analysis: father, mother, oldest (and only) child and youngest child. Of particular interest in these analyses are the partial effects of the explanatory variables and the correlations among the error terms.

a) Cross-Tabulations

Table 1 presents information on the distribution of male partners in two-parent families across categories of the English speaking skills for each level of these skills for the female partner. These data show the broad patterns of English skills within couple families, and they also offer the opportunity to demonstrate the credibility of the data: Where a person speaks English only it is expected that his/her partner will have at least some English skills. Where a person cannot speak English it is unlikely that his/her spouse speaks only English. Both patterns are observed in the data.

From Table 1, the distributions across skill levels of male and female partners in couple families are quite similar. The distribution for males is presented in the final column of the table while that for females is given in the final row. Thus, 16 percent of male partners speak English only as do 15 percent of female partners. One percent of male partners do not speak English at all while three percent of female partners are in this category. Individuals who speak English "well" make up the largest proportion for both male partners (35 percent) and also female partners (32 percent). Given the definition of proficiency to be used in the econometric analyses (speaks only English or speaks English very well), 46 percent of both male partners and female partners are proficient in English.

Within each household, both male and female partners have very similar language skill levels (as presented in the diagonal cells of the table). For example, 97 percent of females who speak only English at home have partners who also speak only English at home.[9] A further 3 percent of their partners are in the English skill categories of "very well" and "well". In the case of females who speak English "not well", 57 percent of their partners also do not speak English well.

It is apparent, however, that the off-diagonal cells in Table 1 are reasonably large. This is even the case if the focus is on the broad categories of "proficient" and "not proficient". Hence, understanding the determinants of language skills within the

[9] This high proportion may arise because the question does not refer to languages one can speak, but as to whether English is spoken at home.

family will be a complex matter. If the correlation between the language skills of male and female partners were solely determined by, say, positive assortative mating on the basis of birthplace, then perhaps an even stronger tendency towards the cells on the leading diagonal to be 100 percent would be expected. The specializations that may arise in the family from comparative advantage either in language skills or in the labor market, as distinct from positive assortative mating, presumably contribute to the patterns observed in Table 1 (see, for example, Chiswick *et al*. (forthcoming) for a more detailed discussion).

Table 2 presents information on the distribution of the male partner's English skill level for each level of these skills for the eldest child (or only child) in a household.[10,11] While the parents in these analyses were all born overseas in non-English speaking countries, the children could be born overseas or in Australia. 38 percent of the children represented in this table speak only English at home (see the final row). A further 50 percent speak a language other than English at home and speak English very well, while a further nine percent speak English well. Thus the English proficiency rate for children is 88 percent, compared to 56 percent for their fathers. Clearly the oldest children of immigrants have English skills superior to those of their fathers.

Comparison of the levels of proficiency for adults in Table 2 (restricted to adult males from non-English speaking countries in couple families <u>with</u> children) and Table 1 (for all adults from non-English speaking countries in couple families) shows that the English skills of adults are stronger where children are present (proficiency

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[10] The distribution of the female partner's English skill level for each level of these skills for the eldest child in a household is presented in Appendix A, Table A2.

[11] The analysis is restricted to children aged 5 years and above (*i.e*., school-aged or older children).

rate for males of 56 percent and for females of 55 percent) than where children are not necessarily present (proficiency rate for both males and females of 46 percent).[12]

The patterns observed when the English skills of children are related to the English skills of parents in Table 2 are similar to those presented in Table 1. Fully 70 percent of fathers whose eldest child spoke only English at home also speak only English at home. Very few of these fathers speak English "not well" or "not at all". In comparison, where the eldest child speaks a language other than English at home and speaks English "well", over 40 percent of the fathers are in the "not well" or "not at all" English skills categories.

The patterns of the English skill levels observed in Table 2 are repeated in Table 3, which presents the distribution of the father's English skill level for each level of these skills for his youngest child.[13, 14] The proportion of children who speak only English is 39 percent (see final row). Those who speak a language other than English at home and speak English "very well" make up 50 percent, while a further 8 percent speak English "well". The proficiency rate for children is 89 percent, compared to 55 percent for their father. The difference in the two proficiency rates indicates that the youngest children of immigrants have superior English skills compared to those of their fathers. A comparison of the proficiency rates of eldest children (88 percent from Table 2) and youngest children (89 percent from Table 3)

[12] The data for females are from Appendix A.

[13] In one-child families the child is included in the cross-tabulations for both the eldest and youngest child. Alternative presentations, such as including singletons in either the cross-tabulations for the eldest child or for the youngest child have little impact on the broad patterns evident in the data.

[14] The distribution of the female partner's English skill level for each level of these skills for the youngest child in a household is presented in Appendix A, Table A3.

suggests that the latter have English skills similar to their older siblings, in spite of the speculation reported above of greater fluency among younger siblings.

The patterns of the relationship between the English skills of children and the English skills of parents in Table 3 are similar to those observed in Tables 1 and 2. Fully 68 percent of the fathers of these youngest children who speak only English also speak only English at home. Less than two percent of the fathers of monolingual English-speaking young children have limited English skills (*i.e.*, they speak English "not well" or "not at all"). However, where the youngest child speaks a language other than English at home and speaks English "well", 43 percent of their fathers have reported English speaking skills of "not well" or "not at all".

b) Multivariate Analyses: Bivariate Probit Models

The broad patterns established through review of Tables 1 to 3 can be quantified more precisely using a bivariate probit framework (see Chiswick, Lee and Miller forthcoming). The model of dominant language fluency used in this study is based in large part on earlier work done by Chiswick and Miller.[15] Thus, proficiency in English is related to variables for age, years of educational attainment, the number of offspring/siblings, period of arrival in Australia and region of birth. Due to the restriction of the data to two-partner families, where rates of marriage are very high (over 96 percent), the model does not include variables for marital status. The variable for the total number of offspring/siblings is used to capture some of the parent-child and within-siblings relationships noted earlier. It is derived from information collected from the female parent on the total number of births. This variable is argued to be

[15] This model has been developed in Chiswick and Miller (1995, 1998, 2001). It has been applied successfully for the U.S., Canada and Australia in these Chiswick-Miller studies and to Israel in Chiswick (1998). For applications to Germany and the UK, see Dustmann (1994) and Shields and Wheatly Price (2002), respectively. The patterns are remarkably similar across countries.

superior to the information on the number of children currently living at home, as the total births variable is more likely to reflect the cumulative (or stock) effect on the English skills of children, rather than the flow effect that is likely to be associated with the use of information only on those children currently living at home.

While information on the total number of offspring/siblings is entered in the model, this information is not disaggregated by age. There are two reasons for this. First, if total births is used, the information on the age of all children is not available – only the age of children living at home can be constructed. Second, as separate analyses are to be undertaken for children, and these analyses will then be integrated (*i.e.*, estimated jointly) with the analyses for parents, there is less need to include detailed information on the age structure of children in the estimating equations.

A further difference between the research by Chiswick and Miller (1996)(1999) and the current study is the absence of variables with behavioral interpretations that have been used in place of birthplace (see Chiswick and Miller (2001)). These variables are usually constructed using information on the immigrant's birthplace or home language and region of residence. They include measures of ethnic concentration, linguistic distance between the immigrant's mother tongue and English, and physical distance between the immigrant's country of origin and the destination. There are two practical reasons for this omission. First, the data set used contains limited birthplace information. There are only 21 relevant birthplace codes, five of which refer to English-speaking regions.[16] There are only six individual non-

[16] In addition to Australia, the 20 foreign birthplace codes are: England; New Zealand; Other United Kingdom and Ireland; Scotland; Italy; Vietnam; Greece; China (excluding Taiwan); Germany; Philippines; Other Southern Europe; Other Southeast Asia; Other Europe and the Former USSR; The Middle East and North Africa; Northern, Central and South America and the Caribbean; Southern Asia; Other Northeast Asia; Other Western Europe; Africa (excluding North Africa); Other

English-speaking birthplaces separately identified among the remaining codes, with the balance of the codes being broad aggregates, such as "Other Southern Europe" and "Other Southeast Asia". With so few individual birthplaces identified, the construction of behavioral variables on the basis of this birthplace information is likely to have limited success. Similarly, only seven languages other than English are separately identified.[17] This precludes using the Census language information to create the behavioral variables.

Second, the analyses reported by Chiswick and Miller (1996)(1999) show that the birthplace-related variables have limited explanatory power in analyses for Australia. This contrasts sharply with the situation when similar models have been estimated for the US and Canada, where there is greater specificity on birthplace and languages spoken. Moreover, unless one is specifically interested in behavioral interpretation from knowing country of origin, which is not the purpose of this study, Chiswick and Miller (1996) (1999) show that birthplace dummy variables are fine.

A final difference between the current set of analyses and the models used in previous research occurs in relation to the models estimated for "children". Children are identified through the census variable "Relationship in household" which has codes for "Child under 15", "Dependent student (15-24)" and "Non-dependent child". The model used to account for the language skills of children includes all the

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Oceania and Antarctica. Although most Western Hemisphere immigrants are from the US and Canada, they cannot be separately identified in the Census.

[17] The seven languages other than English that are identified and the proportions of adult immigrants (20-64 years) reporting these languages are: Italian (2.6 percent); Chinese (2.2 percent); Greek (1.8 percent); Arabic (0.9 percent); Vietnamese (0.9 percent); German (0.6 percent); and Spanish (0.6 percent). Fully, 83.5 percent report using only English at home, and 6.8 percent report using non-English languages other than the seven listed above.

variables included in the analysis of the language skills of their parents, plus a variable for whether the child is still at school. The schooling variable is also defined differently for this group, recording total years of education for children who have left school, and incomplete years of education for (younger) children still at school.

The analyses are conducted in two stages. First, separate analyses are presented for (i) partners, (ii) fathers and eldest child, and (iii) fathers and youngest child. Then analyses are conducted simultaneously for both partners and the children. In each of these models the dependent variable is coded as described above, namely, one if the individual speaks only English at home, or where a language other than English is spoken at home, the individual speaks English "very well". Individuals who speak a language other than English and speak English "well", "not well" or "not at all" are viewed as lacking English language proficiency.

For the first set of analyses, the bivariate probit model to be employed may be expressed as[18]

$$\Pr(LANG_i^{Husband} = 1, LANG_i^{Wife} = 1) = F(\beta^{Husband} X_i^{Husband}, \beta^{Wife} X_i^{Wife}, \rho)$$

where F is the cumulative standard bivariate normal and ρ denotes the correlation between the disturbances in the estimating equations for male and female partners. The coefficients in the models of language skills for male and female partners are allowed to differ in this model.

The interpretation of ρ is that it captures the correlation between the effects of unobservables in the models of language skills of two people. Consider a household where the husband had a relatively high ability for learning English. Under positive assortative mating, this implies similar characteristics for the spouse. As this ability is

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[18] The expression also applies to the cases of Father-Oldest Child and Father-Youngest Child.

not a measured variable in this analysis, its influence will be captured via the error terms in the estimating equations for both male and female partners, and a positive correlation between the error terms for partners would therefore be expected. Alternatively, a model where comparative advantage leads to specialization might see above average English skills of the husband being associated with below average English skills of his female partner, measured variables held constant. A negative correlation between the disturbance terms in the equations would be observed. One spouse may then serve as the translator for the other.[19]

The other possible combinations of language skills of the partners in a household can also be readily determined within the bivariate probit model. For example, the probability of the male partner being proficient in English and his female spouse having limited English skills is given by $\Pr(LANG_i^{Husband} = 1, LANG_i^{Wife} = 0) = F(\beta^{Husband} X_i^{Husband}, -\beta^{Wife} X_i^{Wife}, -\rho)$. The probability of both partners having limited English skills is given by $\Pr(LANG_i^{Husband} = 0, LANG_i^{Wife} = 0) = F(-\beta^{Husband} X_i^{Husband}, -\beta^{Wife} X_i^{Wife}, \rho)$.

Table 4 lists results of the model of dominant language proficiency for partners.[20] The data have been compiled so that the first person in the couple family is male (denoted "husband") and the second person female (denoted "wife"). The results are broadly the same for "husbands" and "wives" in the single equation and bivariate equation probits. They show that dominant language proficiency declines with age (or age at migration given that period of arrival is held constant). This effect is similar to

[19] The bivariate and multivariate probit models are estimated using full information maximum likelihood. The LIMDEP package is used, and Greene (2002) contains technical details.

[20] The sample size in Table 4 differs from that for Table 1 owing to missing information in the explanatory variables included in the Table 4 analyses.

previous studies of adult immigrants, and is generally attributed to the greater difficulty that immigrants have acquiring language skills when they migrate at an older age.

Years of education are associated with better English language skills, with the partial effect of each year of schooling on the probit index being about the same as the impact of close to 30 extra years of age at the time of migration. The skills learned at school, or the index of adaptability provided by the year of schooling variable, is obviously of major importance to an understanding of dominant language proficiency.[21]

It is indicated in the bivariate equation probits that dominant language proficiency decreases with the number of children. This decrease is, in line with expectation, more intense for females than for males, though the point estimates are not significantly different from each other.

Compared to immigrants from Australia's traditional source countries for non-English speaking immigrants (Europe), immigrants from the new source regions (Asia) have poorer English speaking skills.[22] The partial effect on the probit index of

[21] The positive effect of education in destination language proficiency cannot be attributed entirely to learning English in school in the origin since among immigrants to Israel, Hebrew language proficiency increases with level of schooling (Chiswick (1998)).

[22] Countries that form Europe are: Italy; Greece; Germany; Other Southern Europe; Other Europe and the Former USSR; and Other Western Europe. Asia comprises:

coming from Asia is the equivalent of around one less year of schooling (Table 4). This may arise from the greater linguistic distance from English of most of the Asian languages compared to most of the (non-English) European languages (Chiswick and Miller (1998)).

Finally, there is a clear negative relation between being a more recent arrival and English speaking skills.

The correlation coefficient between the disturbance terms in the language skills equation for "Husbands" and "Wives" is sizeable and highly significant (coefficient of 0.925, with a 't' of 147.82). The positive value for this coefficient means that in cases where there are unobservables that lead the husband to have greater (lesser) English speaking skills than predicted by the model, the same or other unobservables will result in the wife having greater (lesser) English skills than predicted by the model. Positive assortative mating on the basis of factors that are not included in the model (motivation, ability, even propensity for language skills development), or one spouse learning from the other spouse who is more proficient for unobserved reasons, or a positive correlation in measurement error will generate a positive correlation in the disturbance terms of the models of English speaking proficiency for husbands and wives.[23]

The results of the language proficiency model for fathers and their oldest child

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Vietnam; China; The Philippines; Other Southeast Asia; Southern Asia; and Other Northeast Asia. The Remaining countries are: Middle East and North Africa; Northern, Central, South America and the Caribbean; Africa; and Other Oceania and Antarctica.

[23] The positive correlation in measurement error could arise from one person filling in the Census form for both partners. However, the pattern in Table 7 for the correlations being much higher for the partner-partner and sibling-sibling comparisons than for the parent-offspring comparisons, suggests the correlations between the disturbance terms does not arise from one person completing the Census form for all household members.

and youngest child living at home are presented in Tables 5 and 6, respectively.[24] The construction of the data is such that the first person in the family is "father" and the second person is "child" in both cases.[25] The single equation results for adult males living in families where there is at least one child in Table 5 are reasonably similar to the single equation results reported for all adult males in Table 4, but they differ in one important respect: the coefficient on the Asia birthplace variable in Table 4 is considerably smaller (in absolute value) than that in Table 5. This implies that compared to fathers from Europe, the English language proficiency of Asian fathers is even lower when children are present.

From Table 5 it is clear that the results for "father" and "oldest child" are quite dissimilar. While the "number of children" variable is negative and insignificant for fathers, it is significant (and negative) for their oldest child. The discussion in Section II argued that the greater the number of siblings the smaller the interaction of children with parents and the greater the interactions among siblings. This would lower proficiency. However, it is also likely that where a child has siblings, this may encourage interactions among children within the family rather than with children from outside the family who may be native-born English monolinguals. The number of siblings does not impact on the language skills of the youngest child. This asymmetry may indicate parental expectations with respect to the teaching of the origin language to their children that vary with birth order.

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[24] The language proficiency model for mothers and their oldest child and youngest child are presented in Tables A4 and A5 of Appendix A, respectively.

[25] In one-child families, this child is included in the analyses for both the oldest and youngest child. Analyses restricted to families with two or more children are presented later.

The second variable where there is a significant difference between the results for fathers and their oldest child is the “year of arrival” variable. Among children, it is only arrivals after 1986 who have poorer English skills (in Australia ten or fewer years) whereas for adult males all arrival cohorts have poorer proficiency than longer-term residents (immigrated before 1981). This is consistent with findings reported in the literature to the effect that the young have a far greater capacity to learn languages than the old, and hence immigrants who are children would be expected to acquire English language skills more rapidly than adult immigrants. The school age young also have intensive exposure to English in school.

There is a positive association between years of education and English skill levels for both fathers and their oldest child, though the coefficient of this variable for “oldest child” is smaller than that for “father”.

The correlation coefficient between the disturbance terms in the two models (0.621) is sizeable and highly significant (Table 5). However, the correlation between the unobserved components in the model for fathers and their eldest child living at home is only about two-thirds (67 percent) of that between the unobserved components in the models for partners (0.925). This suggests that different sets of unobserved factors impact on the dominant language acquisition of parents and of their children.

Table 6 reports results of the model for fathers and their youngest child living at home. Examination of the coefficients in this table reveals that they are in most cases broadly similar to those listed in Table 5. The exception is for the “number of children” variable. As noted above, the coefficient of this variable becomes insignificant in the father- youngest child analysis.

The correlation coefficient presented in Table 6 between the father and the youngest child is positive and significant (0.54). Moreover, it is of about the same order of magnitude as the correlation coefficient in Table 5 for the model covering the English language skills of the father and the oldest child. That is, the unobserved factors in the equation for the English language skills of the youngest and eldest children have similar relationships with the unobserved factors in the equation for the English language skills of their father. Thus, the model appears to be robust to the choice of sibling to use in the bivariate probit analysis.

The analyses reported above were repeated for mother-offspring combinations, with the results reported in Appendix A, available upon request.

Table 7 reports the correlation coefficients between the disturbance terms in the substantive equations for the various bivariate probit models. The correlation coefficient of 0.925 between opposite-sex couples (*i.e.*, "fathers" and "mothers") is much larger than those between parents (male or female) and their children (oldest and youngest), ranging from 0.535 to 0.645. It is also observed that the correlation coefficients between "mothers" and "children" (both oldest and youngest) are larger (0.645 and 0.609, respectively) compared to those between "fathers" and "children" (0.621 and 0.535, respectively). This would appear to be consistent with the proposition that mothers are more involved in the socialization and home produced human capital of their children than are the fathers.

These analyses show quite clearly that there are strong links between the unobserved determinants of English language skills within the family among immigrants in Australia. This result holds for each of the parent-offspring and partners combinations considered. The correlations between the disturbance terms in the models are larger between partners than for the parents-offspring combinations and are stronger for the mother-offspring than for the father-offspring analyses. As one would expect, there is also a very high correlation between the disturbance terms in the model for the eldest child and youngest child. These findings are intuitively reasonable.

c) Multivariate Analyses: A Four-State Probit Model

In the remainder of this section, the models developed above are generalized to a multivariate probit model covering four family members (namely, father, mother, eldest child and youngest child), given as:

$$\Pr(LANG_i^{Husband} = 1, LANG_i^{Wife} = 1, LANG_i^{Eldest} = 1, LANG_i^{Youngest} = 1) =$$

$$F(\beta^{Husband} X_i^{Husband}, \beta^{Wife} X_i^{Wife}, \beta^{Eldest} X_i^{Eldest}, \beta^{Youngest} X_i^{Youngest}, \rho_{HW}, \rho_{HE}, \rho_{HY}, \rho_{WE}, \rho_{WY}, \rho_{EY})$$

where "eldest" (E) and "youngest" (Y) refer to the eldest child and youngest child living at home, respectively, and ρ_{ij} is the correlation coefficient between the disturbance terms in the equations for persons *i* and *j*.

It is to be noted that the sample for this estimation is restricted to two-parent families with at least two children living at home. In other words, couple families with only one child living at home (*i.e.*, the eldest child is also the youngest child) are excluded from the analysis. This restriction reduces the sample size to around 40 percent of that used in the earlier analyses.

Estimates from the four-state probit model are presented in Table 8. The results show that language proficiency declines with age for "mother", "eldest child", and "youngest child". The age effect for father is negative and of the same order of magnitude as that reported above in the bivariate probit analyses, but the 't' statistic is only 1.18.

Years of education are positively associated with English skill levels for every member of the family included in the statistical analysis. The coefficients of the years of schooling variable for "eldest child" and "youngest child" are smaller than those for “father” and “mother”. In the model for “eldest child”, those who are still at school have lower English language proficiency. This relationship was not evident in the bivariate analyses presented above, where the “eldest child” sample included one-child families. Combining the results of the separate analyses in this manner suggests that the Table 8 finding may be associated with the age proximity of children: where the eldest child in a family with at least two children is still at school, and the youngest child is at least 5 years of age, the children may be sufficiently close in age that they interact more than in the case where there is a wider gap between the ages of the youngest and eldest child. This interaction may involve the use of their parents' mother tongue.

Compared to European immigrants, Asian immigrants have poorer English speaking skills. This is especially true for the children. There is a clear negative association between being a more recent arrival and English speaking skills in the models for “father” and “mother”.

The six correlation coefficients between unobserved influences on English skills, listed in Panel A of Table 9, are positive and significant. The correlation coefficient between fathers and mothers (*i.e.*, opposite-sex couples), 0.921, is much larger than those between parents (fathers and mothers) and their child (either eldest or youngest). The point estimates of the coefficient between fathers and their eldest child (0.638) and between fathers and their youngest child (0.518) suggest that there is a stronger linguistic bond between fathers and their eldest child (who for a while was also an only child), than with their youngest child. It appears that mothers have a stronger bond with their youngest child rather than with their eldest child (0.604 vs. 0.559). Consistent with the literature, there is a strong linguistic bond between siblings, as indicated by the high value of the correlation between the error or residual terms for the eldest child and the youngest child (0.913) in families with at least two children.

The separation of the sample according to whether the eldest child was born in Australia or born overseas yields interesting results (see Panels B and C of Table 9). Compared to the case where the eldest children are not disaggregated by birthplace (Panel A), the point estimates of the correlation coefficients between parents (mothers and fathers) and their children (eldest and youngest) have much lower values for the sample where the eldest children were born in Australia (Panel B). The reverse holds true for the sample where the eldest children were born overseas (see Panel C). These results suggest a greater inter-connectedness between parents and their children's socialization (country specific human capital produced at home) where their eldest children were born overseas.[26] Presumably this also reflects the impact of stronger origin/cultural heritage factors that influence both parents and child where the eldest children were born abroad.

The comparison of the results in Panels B and C also reveal that there is a stronger bond between siblings for the sample where the eldest child was born in Australia (0.984) compared to the case where the eldest child was born overseas (0.894). Where the eldest child was born abroad some of their younger siblings may have been born in Australia. However, where the eldest child was born in Australia nearly all of his/her younger siblings have also been born in Australia. The difference between the correlations between the error terms for two siblings in Panels B and C could therefore be due to foreign-born children having more origin-specific characteristics, including language skills, compared to their Australian-born

[26] Or perhaps overseas-born children are more like their parents than their Australian-born counterparts.

counterparts.

V. Summary and Conclusions

This paper extends the line of research that views migration as a consequence of a family decision making process, rather than solely as an individual decision. It focuses on the determination of destination language proficiency among members of immigrant families—fathers, mothers and children.

Building on earlier research on the determinants of destination language proficiency among immigrants, the paper discusses the literature and theoretical relationships among the language skills of spouses/partners, between parents and children, and among siblings. Between spouses there may be a positive assortative mating on the unmeasured determinants of language proficiency (*e.g.*, linguistic ability) as well as the measured determinants (*e.g.*, schooling level, country of origin). Specialization in activities within the marriage might, however, result in negative assortative mating on some relevant dimensions. There may also be language learning between spouses, that is, one spouse learning from the other.

Several factors might influence the parent/child proficiency relationship. The presence of children might lower parental destination language proficiency if children serve as translators for their parents (more likely for non-labor market than for labor market activities), if children lower their parents', especially their mother's, labor supply, and if parents use the origin language at home to transmit it and the origin culture to their children. On the other hand, because of the greater exposure to the destination language in school and the greater ability of youths to acquire destination language skills, they may serve as their parents' teachers and role models in the destination language. Moreover, the relationship between parent's and child's proficiency maybe stronger for the mother because of the greater time input of mothers in the rearing of children.

Siblings, too, can influence language skills. The larger the number of siblings the greater the linguistic interactions in the home with destination language speakers, and the less the interaction with their foreign-speaking parents, especially for the youngest as distinct from the oldest child.

The expanded family-based model of destination language proficiency is tested using data on immigrants from non-English-speaking origins in the 1996 Australian Census of Population and Housing microdata file. The Census asks if there are any languages other than or in addition to English spoken in the home. If so, it asks the respondent to identify the language and asks for level of proficiency in English—very well, well, not well and not at all. Not surprisingly, the simple cross-tabulations reveal a strong positive relationship between the destination (English) language skills of spouses, between parents and their children, and among siblings.

For the econometric analyses of this study, those who report only English or that they speak English "very well" are treated as proficient in English, all others are treated as not proficient. The econometric analyses are based on probit analyses for each type of person separately (husband, wife, eldest child, youngest child), bivariate probit analyses for pair-wise relationships, and four-state (multivariate) probit analysis that jointly considers all four relationships. The findings are very robust across statistical techniques.

English language proficiency for all four groups is greater the younger the age at migration (and for children born in Australia), the longer the duration in the destination, and the higher the level of education. Compared with those born in Europe, immigrants are less proficient if born in Asia, and among the immigrants the parents are more proficient if born outside of Europe and Asia. A larger number of children in the family has a negative effect on parents' proficiency and on the proficiency of the oldest child in the bivariate probit analyses, but these effects are not statistically significant in the multivariate probit analysis. Other measured variables the same, gender has no separate effect on language proficiency.

In the multivariate probit analysis there is a very high positive correlation in the residuals between the father and the mother (over 0.9), as well as between the eldest child and the parents when this child was born overseas (over 0.8). Because of the very high level of proficiency for children born in Australia, the parent/child correlations are lower if the eldest child is born in Australia (0.3 for the parent/eldest child residual correlation). The correlation between the residuals is stronger in the mother-child analysis than in the father-child analysis, especially when the eldest child is born overseas. This presumably reflects children's language learning at home, which is more likely to come from the mother than the father. The correlation between the residuals for the eldest/youngest child is very high (0.9), regardless of the eldest child's birthplace.

These correlations between and among residuals suggest there is a positive relationship between the unmeasured determinants of proficiency across family members. This may be due to positive "assortative mating" (positive correlations among of marriage partners), inherited genetic factors between parents and children, or environmental factors among family members that make them more alike in the unmeasured characteristics that determine proficiency. It may also be due to the learning in the household among family members from each other. If for some (unmeasured) reason one family member acquires greater proficiency, the other family members learn from him or her. The strong unmeasured bond between parents and between (eldest and youngest) siblings is not surprising. The stronger relationship between the unmeasured determinants of language skills between mother and child than between father and child may be due to the greater involvement of mothers in child-rearing.

Moreover, the analysis also suggests that previous estimates of rates of return from investment in language skills based on individual earnings and language proficiency may be biased downward. If language learning takes place in the home, there is a spill-over effect from one family member's investment in language training, namely, the improved language skills of other family members.

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TABLE 1: MALE PARTNER'S ENGLISH SPEAKING SKILLS BY FEMALE PARTNER'S ENGLISH SPEAKING SKILLS, 20-64 YEAR OLD INDIVIDUALS FROM NON-ENGLISH SPEAKING COUNTRIES, 1996 CENSUS OF POPULATION AND HOUSING

Male Partner's English Skill Level	Female Partner's English Skill Level					
	English only	Very well	Well	Not well	Not at all	% of Population[a]
English only	96.5	2.5	0.5	0.3	0.8	15.7
Very well	2.3	77.9	16.1	7.7	3.8	30.6
Well	0.9	15.9	73.3	33.7	15.8	35.2
Not well	0.3	3.5	10.0	56.9	45.9	17.0
Not at all	0.0	0.2	0.1	1.4	33.8	1.4
Total[a]	100.00	100.00	100.00	100.00	100.00	100.00
% of Population	15.2	30.3	31.5	20.0	2.9	100.00

[a]Total may not sum to zero due to rounding.
Sample size is 4545.

Source: 1996 Australian Census of Population and Housing

TABLE 2: MALE PARTNER'S ENGLISH SPEAKING SKILLS BY ELDEST CHILD'S ENGLISH SPEAKING SKILLS, 1996 CENSUS OF POPULATION AND HOUSING*

Male Adult's English Skill Level	Eldest Child's English Skill Level					
	English only	Very well	Well	Not well	Not at all	% of Population[(a)]
English only	69.6	0.4	1.1	-	-	26.8
Very well	21.0	39.3	13.4	13.0	5.0	29.1
Well	7.7	42.5	44.9	28.3	40.0	29.1
Not well	1.5	17.2	35.9	53.3	35.0	13.8
Not at all	0.3	0.6	4.7	5.4	20.0	1.1
Total[(a)]	100.00	100.00	100.00	100.00	100.00	100.00
% of Population	38.1	49.8	9.3	2.3	0.5	100.00

*Male adults are 20-64 years old and were born abroad in non-English speaking countries. Eldest child includes only child
[(a)]Total may not sum to zero due to rounding.
Sample size is 3937.

Source: 1996 Australian Census of Population and Housing

TABLE 3: MALE PARENT'S ENGLISH SPEAKING SKILLS BY YOUNGEST CHILD'S ENGLISH SPEAKING SKILLS, 1996 CENSUS OF POPULATION AND HOUSING*

Male Adult's English Skill Level	Youngest Child's English Skill Level					
	English only	Very well	Well	Not well	Not at all	% of Population[(a)]
English only	67.5	0.4	-	-	-	26.8
Very well	22.1	36.7	12.5	19.5	6.3	28.4
Well	8.5	43.2	44.3	23.4	43.8	29.2
Not well	1.6	19.1	38.1	52.0	37.5	14.6
Not at all	0.3	0.7	5.1	5.2	12.5	1.1
Total[(a)]	100.00	100.00	100.00	100.00	100.00	100.00
% of Population	39.4	49.5	8.3	2.2	0.5	100.00

*Male adults are 20-64 years old and were born abroad in non-English speaking countries. Youngest child includes only children.
[(a)]Total may not sum to zero due to rounding.
Sample size is 3296.

Source: 1996 Australian Census of Population and Housing

TABLE 4: BIVARIATE PROBIT MODEL OF ENGLISH SPEAKING SKILLS, 20-64 YEAR OLD OPPOSITE-SEX PARTNERS FROM NON-ENGLISH SPEAKING COUNTRIES, 1996 CENSUS OF POPULATION AND HOUSING

	Single Equation Probit		Bivariate Probit	
Variable	Husband	Wife	Husband	Wife
Constant	-2.084 (13.92)	-1.967 (12.08)	-1.446 (11.54)	-1.327 (9.51)
Age	-0.006 (2.89)	-0.011 (5.00)	-0.006 (3.32)	-0.008 (4.52)
Years of schooling	0.195 (21.44)	0.217 (21.63)	0.142 (18.64)	0.156 (18.28)
Number of children	-0.015 (0.86)	-0.013 (0.76)	-0.040 (2.39)	-0.051 (2.93)
Birthplace Region (Europe)				
Asia	-0.180 (3.06)	-0.201 (3.38)	-0.030 (0.58)	-0.100 (1.89)
Remaining	0.251 (4.09)	0.259 (4.17)	0.316 (5.80)	0.326 (6.12)
Year of Arrival (Before 1981)				
1981-1985	-0.427 (5.52)	-0.572 (7.23)	-0.366 (6.01)	-0.512 (7.68)
1986-1990	-0.458 (6.69)	-0.524 (7.45)	-0.494 (9.02)	-0.633 (11.12)
1991-1994	-0.604 (7.26)	-0.805 (9.95)	-0.620 (9.01)	-0.798 (12.35)
1995-1996	-0.772 (6.33)	-1.227 (10.49)	-0.799 (7.49)	-1.060 (11.54)
χ^2	613.61	708.41	868.36	
Prediction success Rate (%)	66.93	67.67	88.35	
Correlation coefficient, ρ	-		0.925 (147.82)	
Sample size	4104	4104	4104	

Note: Numbers in parentheses are 't' statistics.

Source: 1996 Australian Census of Population and Housing

Table 5: Bivariate Probit Model of English Speaking Skills, 20-64 Year Old Male Adults And Their Eldest Child From Non-English Speaking Countries, 1996 Census of Population and Housing

Variable	Single Equation Probit		Bivariate Probit	
	Father	Eldest Child	Father	Eldest Child
Constant	-1.115 (5.77)	1.451 (7.67)	-0.938 (5.03)	1.261 (6.79)
Age	-0.018 (6.26)	-0.052 (6.24)	-0.017 (6.03)	-0.044 (5.13)
Female	(a)	0.047 (0.72)	(a)	0.054 (0.84)
Number of children	-0.014 (0.63)	-0.061 (1.92)	-0.022 (1.00)	-0.075 (2.42)
Years of schooling	0.196 (18.83)	0.141 (10.96)	0.177 (17.82)	0.138 (11.08)
Still schooling	(a)	-0.101 (0.83)	(a)	-0.041 (0.35)
Birthplace Region (Europe for father, Australia for child)				
Europe	(a)	-0.228 (1.47)	(a)	0.105 (0.64)
Asia	-0.272 (4.15)	-0.797 (5.74)	-0.185 (2.82)	-0.531 (3.68)
Remaining	0.191 (2.90)	-0.094 (0.57)	0.180 (2.80)	0.142 (0.82)
Year of Arrival (Before 1981)				
1981-1985	-0.755 (8.80)	-0.118 (0.67)	-0.699 (8.17)	-0.202 (1.10)
1986-1990	-0.847 (10.69)	-0.282 (1.89)	-0.827 (10.46)	-0.460 (3.02)
1991-1994[b]	-0.899 (9.02)	-0.907 (6.25)	-0.949 (9.82)	-1.038 (6.94)
1995-1996	-1.346 (7.94)	(b)	-1.108 (6.14)	(b)
χ^2	604.41	506.90	973.67	
Prediction success Rate (%)	67.60	88.00	64.68	

Correlation coefficient, ρ	-		0.621 (19.52)
Sample size	3191	3191	3191

Note: Numbers in parentheses are ‘t’ statistics.
[(a)]Variable not relevant.
[(b)]The year of arrival dummy variables, 1991-1994 and 1995-1996, have been combined to form 1991-1996 for children.

Source: 1996 Australian Census of Population and Housing

TABLE 6: BIVARIATE PROBIT MODEL OF ENGLISH SPEAKING SKILLS, 20-64 YEAR OLD MALE ADULTS AND THEIR YOUNGEST CHILD FROM NON-ENGLISH SPEAKING COUNTRIES, 1996 CENSUS OF POPULATION AND HOUSING

	Single Equation Probit		Bivariate Probit	
Variable	Father	Youngest Child	Father	Youngest Child
Constant	-1.364 (6.55)	1.169 (5.44)	-1.208 (5.99)	1.073 (5.07)
Age	-0.014 (4.51)	-0.038 (3.71)	-0.013 (4.40)	-0.034 (3.12)
Female	[a]	0.032 (0.44)	[a]	0.019 (0.27)
Number of children	-0.002 (0.09)	-0.020 (0.64)	-0.007 (0.30)	-0.025 (0.80)
Years of schooling	0.195 (17.68)	0.124 (8.25)	0.179 (16.98)	0.122 (7.94)
Still schooling	[a]	0.177 (1.26)	[a]	0.199 (1.48)
Birthplace Region (Europe for father, Australia for child)				
Europe	[a]	-0.381 (2.07)	[a]	-0.079 (0.37)
Asia	-0.251 (3.54)	-1.022 (6.01)	-0.189 (2.66)	-0.830 (4.39)
Remaining	0.286 (3.97)	-0.143 (0.73)	0.269 (3.82)	0.013 (0.06)
Year of Arrival (Before 1981)				
1981-1985	-0.757 (7.90)	-0.013 (0.06)	-0.712 (7.58)	-0.110 (0.46)
1986-1990	-0.807 (9.14)	-0.070 (0.39)	-0.770 (8.62)	-0.216 (1.11)
1991-1994[b]	-0.837 (7.49)	-0.810 (4.60)	-0.885 (8.02)	-0.904 (4.64)
1995-1996	-1.384 (7.38)	[b]	-1.210 (5.48)	[b]
χ^2	513.22	419.68	808.70	
Prediction success Rate (%)	67.46	89.31	62.52	

Correlation coefficient, ρ	-		0.535 (14.48)
Sample size	2815	2815	2815

Note: Numbers in parentheses are ‘t’ statistics.
[(a)]Variable not relevant.
[(b)]The year of arrival dummy variables, 1991-1994 and 1995-1996, have been combined to form 1991-1996 for children.

Source: 1996 Australian Census of Population and Housing

TABLE 7: CORRELATION COEFFICIENTS BETWEEN RESIDUALS OF ENGLISH SPEAKING SKILLS OBTAINED FROM TABLES 4, 5, 6, A3, AND A4 (APPENDIX A), 1996 CENSUS OF POPULATION AND HOUSING (BIVARIATE PROBIT ANALYSES)

	Mother	Eldest Child	Youngest Child
Father	0.925	0.621	0.535
	(0.006)	(0.032)	(0.037)
Mother		0.645	0.609
		(0.032)	(0.036)
Eldest Child			0.914[(a)]
			(0.021)

[(a)] The analysis for this cell excludes single-child families.
Numbers in parentheses are standard errors.
Source: 1996 Australian Census of Population and Housing

TABLE 8: MULTIVARIATE PROBIT MODEL OF ENGLISH SPEAKING SKILLS, 20-64 YEAR OLD OPPOSITE-SEX PARTNERS FROM NON-ENGLISH SPEAKING COUNTRIES AND THEIR ELDEST CHILD AND YOUNGEST CHILD, 1996 CENSUS OF POPULATION AND HOUSING

Variable	Single Equation Probit				Multivariate Probit			
	Father	Mother	Eldest Child	Youngest Child	Father	Mother	Eldest Child	Youngest Child
Constant	-1.915 (5.21)	-0.969 (2.66)	2.347 (6.67)	1.525 (4.33)	-1.089 (3.56)	-0.594 (1.94)	1.845 (5.83)	1.008 (3.20)
Age	-0.004 (0.73)	-0.029 (4.55)	-0.081 (5.72)	-0.073 (2.80)	-0.005 (1.18)	-0.020 (3.78)	-0.045 (3.43)	-0.034 (1.51)
Female	(a)	(a)	0.034 (0.31)	0.029 (0.29)	(a)	(a)	-0.073 (0.73)	0.067 (0.74)
Number of children	-0.038 (0.92)	-0.001 (0.03)	-0.049 (0.85)	-0.045 (0.89)	-0.073 (1.75)	-0.037 (0.85)	-0.065 (1.09)	-0.054 (1.08)
Years of schooling	0.186 (10.79)	0.208 (10.92)	0.115 (4.95)	0.143 (4.78)	0.126 (9.00)	0.141 (8.80)	0.083 (4.39)	0.108 (4.03)
Still schooling	(a)	(a)	-0.587 (3.24)	-0.123 (0.60)	(a)	(a)	-0.333 (2.16)	0.046 (0.27)
Birthplace Region (Europe for parents, Australia for children)								
Europe	(a)	(a)	-0.060 (0.25)	-0.255 (0.73)	(a)	(a)	0.022 (0.07)	-0.123 (0.33)
Asia	-0.249 (2.34)	-0.326 (2.99)	-0.657 (3.11)	-0.815 (2.58)	0.007 (0.07)	-0.117 (1.15)	-0.450 (2.08)	-0.661 (2.23)

Remaining	0.070	-0.075	0.080	-0.130	0.102	0.016	0.048	-0.049
	(0.62)	(0.66)	(0.32)	(0.39)	(0.96)	(0.15)	(0.24)	(0.17)
Year of Arrival (Before 1981)								
1981-1985	-0.414	-0.601	-0.043	-0.048	-0.377	-0.541	0.070	0.291
	(3.10)	(4.51)	(0.17)	(0.13)	(3.20)	(4.74)	(0.28)	(0.84)
1986-1990	-0.286	-0.488	-0.334	0.197	-0.391	-0.458	-0.342	0.200
	(2.21)	(3.78)	(1.50)	(0.60)	(3.42)	(4.28)	(1.63)	(0.66)
1991-1994[b]	-0.400	-0.491	-0.876	-0.582	-0.441	-0.522	-0.621	-0.346
	(2.60)	(3.13)	(3.88)	(1.84)	(2.59)	(3.72)	(2.61)	(1.28)
1995-1996	-0.841	-1.243	[b]	[b]	-0.534	-0.794	[b]	[b]
	(3.32)	(4.41)			(1.95)	(2.82)		
χ^2	154.81	185.03	150.64	120.47	357.01			
Prediction success rate (%)	65.49	67.93	86.96	86.05	-	-	-	-
Sample size	1104	1104	1104	1104	1104			

Note: Numbers in parentheses are ‘t’ statistics.
[a]Variable not relevant.
[b]The year of arrival dummies, 1991-1994 and 1995-1996, have been combined to form 1991-1996 for children.

Source: 1996 Australian Census of Population and Housing

TABLE 9: CORRELATION COEFFICIENTS BETWEEN RESIDUALS OF ENGLISH SPEAKING SKILLS AMONG FATHERS, MOTHERS, THEIR ELDEST AND YOUNGEST CHILDREN BY BIRTHPLACE OF ELDEST CHILD, 1996 CENSUS OF POPULATION AND HOUSING (MULTISTATE PROBIT ANALYSES)

	Panel A: Eldest Child Born in Australia or Overseas (Sample size 1104)			Panel B: Eldest Child Born in Australia (Sample size 607)			Panel C: Eldest Child Born Overseas (Sample size 497)		
	Mother	Eldest Child	Youngest Child	Mother	Eldest Child	Youngest Child	Mother	Eldest Child	Youngest Child
Father	0.921	0.638	0.518	0.902	0.295	0.377	0.957	0.816	0.671
Mother		0.559	0.604		0.300	0.439		0.881	0.848
Eldest Child			0.913			0.984			0.894

Source: 1996 Australian Census of Population and Housing

APPENDIX A

TABLE A1: MEANS AND STANDARD DEVIATIONS FOR VARIABLES USED IN STUDY OF MALE AND FEMALE PARTNERS ENGLISH SPEAKING SKILLS (TABLE 4)

Variable	*Male Partner*	*Female Partner*
Proficient in English	0.424 (0.49)	0.414 (0.49)
Age	44.097 (10.34)	43.081 (10.62)
Years of Schooling	12.246 (2.78)	11.708 (2.62)
Number of Children	2.250 (1.30)	2.250 (1.30)
Europe	0.512 (0.50)	0.498 (0.50)
Asia	0.307 (0.46)	0.325 (0.47)
Remaining Birthplaces	0.180 (0.38)	0.177 (0.38)
Arrived Before 1981	0.617 (0.49)	0.590 (0.49)
Arrived 1981-1985	0.099 (0.30)	0.099 (0.30)
Arrived 1986-1990	0.161 (0.37)	0.156 (0.36)
Arrived 1991-1994	0.088 (0.28)	0.108 (0.31)
Arrived 1995-1996	0.036 (0.19)	0.047 (0.21)
Sample Size	4104	4104

Numbers in parentheses are standard deviations

TABLE A2: FEMALE PARTNER'S ENGLISH SPEAKING SKILLS BY ELDEST CHILD'S ENGLISH SPEAKING SKILLS, 1996 CENSUS OF POPULATION AND HOUSING*

Female Adult's English Skill Level	Eldest Child's English Skill Level					
	English only	Very well	Well	Not well	Not at all	% of Population[(a)]
English only	69.5	0.4	0.8	-	-	26.6
Very well	22.2	37.4	9.3	10.8	5.0	28.1
Well	6.3	40.2	35.0	19.4	15.0	26.2
Not well	1.8	19.7	45.8	57.0	40.0	16.4
Not at all	0.2	2.4	9.3	12.9	40.0	2.7
Total[(a)]	100.0	100.0	100.0	100.0	100.0	100.0
% of Population	38.0	49.4	9.8	2.3	0.5	100.0

*Female adults are 20-64 years old and were born abroad in non-English speaking countries.
(a)Total may not sum to zero due to rounding.
Sample size is 4065.

Source: 1996 Australian Census of Population and Housing

TABLE A3: FEMALE PARTNER'S ENGLISH SPEAKING SKILLS BY YOUNGEST CHILD'S ENGLISH SPEAKING SKILLS, 1996 CENSUS OF POPULATION AND HOUSING*

Female Adult's English Skill Level	Youngest Child's English Skill Level					
	English only	Very well	Well	Not well	Not at all	% of Population[(a)]
English only	66.7	0.5	-	-	-	26.0
Very well	23.7	35.3	8.3	11.5	6.3	27.7
Well	7.4	40.5	35.1	19.2	12.5	26.6
Not well	1.8	21.4	45.0	59.0	37.5	16.8
Not at all	0.3	2.4	11.6	10.3	43.8	2.8
Total[(a)]	100.0	100.0	100.0	100.0	100.0	100.0
% of Population	38.7	49.7	8.9	2.3	0.5	100.0

*Female adults are 20-64 years old and were born abroad in non-English speaking countries. Youngest child includes only children.
[(a)]Total may not sum to zero due to rounding.
Sample size is 3410.

Source: 1996 Australian Census of Population and Housing

TABLE A4: BIVARIATE PROBIT MODEL OF ENGLISH SPEAKING SKILLS, 20-64 YEAR OLD FEMALE ADULTS AND THEIR ELDEST CHILD FROM NON-ENGLISH SPEAKING COUNTRIES, 1996 CENSUS OF POPULATION AND HOUSING

	Single Equation Probit		Bivariate Probit	
Variable	Mother	Eldest Child	Mother	Eldest Child
Constant	-0.932 (4.38)	1.535 (7.80)	-0.669 (3.26)	1.416 (7.37)
Age	-0.025 (8.00)	-0.059 (6.78)	-0.025 (7.99)	-0.052 (5.81)
Female	[a]	0.092 (1.36)	[a]	0.061 (0.95)
Number of children	-0.009 (0.38)	-0.062 (1.91)	-0.015 (0.65)	-0.070 (2.20)
Years of schooling	0.211 (18.07)	0.143 (10.91)	0.183 (16.38)	0.134 (10.26)
Still schooling	[a]	-0.173 (1.39)	[a]	-0.106 (0.87)
Birthplace Region (Europe)				
Europe	[a]	-0.193 (1.20)	[a]	0.172 (1.01)
Asia	-0.167 (2.46)	-0.716 (4.81)	-0.103 (1.55)	-0.393 (2.47)
Remaining	0.173 (2.49)	0.040 (0.24)	0.162 (2.40)	0.297 (1.61)
Year of Arrival				
1981-1985	-0.683 (8.03)	-0.151 (0.82)	-0.600 (7.21)	-0.242 (1.28)
1986-1990	-0.766 (9.72)	-0.285 (1.82)	-0.707 (9.17)	-0.491 (2.99)
1991-1994[b]	-1.083 (10.57)	-0.916 (5.96)	-1.124 (11.73)	-1.127 (7.07)
1995-1996	-1.513 (9.26)	[b]	-1.254 (7.70)	[b]
χ^2	605.19	463.63	900.56	
Prediction success Rate (%)	67.98	87.20	64.18	

Correlation coefficient, ρ		-	0.645 (20.21)
Sample size	2945	2945	2945

Note: Numbers in parentheses are 't' statistics.
[(a)]Variable not relevant.
[(b)]The year of arrival dummy variables, 1991-1994 and 1995-1996, have been combined to form 1991-1996 for children.

Source: 1996 Australian Census of Population and Housing

TABLE A5: BIVARIATE PROBIT MODEL OF ENGLISH SPEAKING SKILLS, 20-64 YEAR OLD FEMALE ADULTS AND THEIR YOUNGEST CHILD FROM NON-ENGLISH SPEAKING COUNTRIES, 1996 CENSUS OF POPULATION AND HOUSING

	Single Equation Probit		Bivariate Probit	
Variable	Mother	Youngest Child	Mother	Youngest Child
Constant	-0.991 (4.35)	1.201 (5.31)	-0.797 (3.64)	1.199 (5.45)
Age	-0.025 (6.90)	-0.048 (4.51)	-0.024 (6.85)	-0.047 (4.14)
Female	(a)	0.083 (1.12)	(a)	0.050 (0.68)
Number of children	0.005 (0.18)	-0.016 (0.49)	0.000 (0.00)	-0.027 (0.82)
Years of schooling	0.205 (16.63)	0.137 (8.86)	0.185 (15.89)	0.133 (8.19)
Still schooling	(a)	0.120 (0.81)	(a)	0.118 (0.83)
Birthplace Region (Europe)				
Europe	(a)	-0.274 (1.39)	(a)	0.101 (0.43)
Asia	-0.148 (2.04)	-0.938 (5.01)	-0.096 (1.36)	-0.604 (2.75)
Remaining	0.209 (2.80)	-0.076 (0.36)	0.188 (2.62)	0.176 (0.73)
Year of Arrival				
1981-1985	-0.651 (7.11)	-0.017 (0.07)	-0.617 (6.90)	-0.197 (0.74)
1986-1990	-0.694 (7.87)	-0.096 (0.49)	-0.668 (7.72)	-0.340 (1.52)
1991-1994[b]	-0.969 (8.47)	-0.822 (4.29)	-1.034 (9.75)	-1.054 (4.71)
1995-1996	-1.483 (8.29)	(b)	-1.286 (6.89)	(b)
χ^2	484.03	386.34	755.08	
Prediction success Rate (%)	67.55	88.82	61.59	

Correlation coefficient, ρ	-		0.609 (17.01)
Sample size	2567	2567	2567

Note: Numbers in parentheses are ‘t’ statistics.
[a]Variable not relevant.
[b]The year of arrival dummy variables, 1991-1994 and 1995-1996, have been combined to form 1991-1996 for children.

Source: 1996 Australian Census of Population and Housing