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Language Skills and Labor Market Performance of Immigrants in the Netherlands

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Abstract

Many immigrants in the Netherlands have poor Dutch language skills. They face problems in speaking and reading Dutch. Our paper investigates how these problems affect their labor market performance in terms of employment, hours of work and wages. We find that for female immigrants language problems have significantly negative effects on hourly wages but not on employment probability and hours of work. For male immigrants language problems do not affect employment probability, hours of work or hourly wages.

Keywords: Language skills, immigrants, labor market performance
JEL code: J24, J15

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1 Introduction

Language skills are considered to be extremely important for the social and economic integration of immigrants. Proficiency in the host language may have positive effects on immigrants' job search and their labor productivity at the workplace. Therefore, lack of language skills can be a severe obstacle to career success. Quite a few empirical studies investigate the effects of language skills on labor market performance of male immigrants with a focus on their earnings. Summarizing previous studies Chiswick and Miller (2014) conclude that language proficiency can increase earnings of adult male immigrants in the range from 5% to 35%.

Empirical studies are predominantly about language effects on earnings of male immigrants.[1] They cover a range of languages, such as English in the UK (Dustmann and Fabbri, 2003; Miranda and Zhu, 2013a,b), the US (Bleakley and Chin, 2004) and Australia (Chiswick and Miller, 1995), German in Germany (Dustmann, 1994; Dustmann and van Soest, 2001, 2002), Hebrew in Israel (Chiswick, 1998) and Spanish and Catalan in Spain (Budría and Swedberg, 2012; Di Paolo and Raymond, 2012). Studies about language effects on labor market performance have to deal with several threats to identification. Biases could come from three sources. First, language skills and labor market performance may be correlated through unobserved characteristics, which may lead to an upward bias in the estimated effects of language skills. Second, the experience of employment could reversely cause the improvement in language skills. Third, self-reported language measures from survey data may be subject to measurement errors that lead to an underestimation of the language effects. Most empirical studies rely on an instrumental variables (IV) approach to account for these potential sources of bias. Instrumental variables which are frequently used include age at arrival in host countries, minority concentration in the area where the immigrant lives, linguistic distance between the immigrant's mother tongue and the language of the host country, language spoken at home, number of children, overseas marriage and parental education.[2] IV parameter

[1] Bleakley and Chin (2004), Dustmann and Fabbri (2003) and Di Paolo and Raymond (2012) have female immigrants in their sample but they do not analyze language effects separately for males and females. Dustmann and van Soest (2002) study wage effects of language skills for women but they have difficulties in finding suitable instrumental variables for female language skills. Miranda and Zhu (2013a) study the immigrant-native wage gap for female employees in the UK with a focus on sample selection bias.

[2] According to Dustmann and van Soest (2002) parental education can serve as an instrument variable for language skills of children. The problem with this instrument is that parental education is correlated with family networks which can benefit children's labor market performance. In this sense, parental education may have a direct effect on children's earnings and thus it is not a valid instrument. However, as Dustmann and van Soest (2002) argue immigrant parents do not have much access to these family networks. Therefore, it is likely that parental educational attainment does not have a direct effect on

estimates are usually larger than OLS parameter estimates, which indicates that the potential upward bias from unobserved heterogeneity and reverse causality is dominated by the downward bias from measurement errors (Dustmann and van Soest, 2002; Dustmann and Fabbri, 2003; Bleakley and Chin, 2004).

Our study focuses on language skills and labor market performance of immigrants in the Netherlands. Here, the labor market position of immigrants is weak, as it is in many European countries (Boeri and van Ours, 2013). Employment rate of immigrants is lower and unemployment rate is higher than those of native workers. Immigrants in the Netherlands are predominantly from the former Dutch colonies and from Turkey and Morocco (see Van Ours and Veenman (2005) for an overview of recent immigration history). Many immigrants in the Netherlands have poor Dutch language skills and face problems in speaking and reading Dutch. We study how these Dutch language problems affect their labor market performance in terms of employment, hours of work and wage.

To account for potential endogeneity problems, we use an instrumental variables approach based on the interaction of two variables: the language spoken during childhood and age at arrival in the Netherlands. The first variable is a dummy for whether one grew up speaking Dutch or other languages.[3] Speaking other languages during childhood is associated with a worse command of Dutch at adulthood. The second variable is age at arrival in the host country, a well-established determinant of language skills of immigrants in earlier studies by Bleakley and Chin (2004, 2010) and Miranda and Zhu (2013b). Children who are exposed to a new language early are likely to have good language skills at adulthood. Immigrants arriving at a later age have much more problems in obtaining language skills (Sweetman and van Ours, 2014). We use the interaction of the two variables because age at arrival only affects language skills of immigrants who spoke non-Dutch languages during childhood. As we discuss in more detail below, our identifying assumption is that the non-language effects of age at arrival on labor market performance are the same for two types of immigrants, those who spoke Dutch during childhood and those who did not. Our main findings are language problems for male immigrants have no significant effect on their labor market performance. Language problems for female immigrants have a significant negative effect on their hourly wages but do not affect their employment and hours of work.

Our contribution to the literature is threefold. First, we extend the existing literature

children's earnings.

[3]The reason why many immigrants spoke Dutch at childhood is that they may come from former Dutch colonies. Based on our sample, 12% of Dutch speakers at childhood originate from Turkey/Morocco, 49% from former Dutch colonies, 11% from other non-western countries and 28% from other western countries.

by not only considering the language effects on earnings, but also on employment and hours of work. This provides a deeper understanding of the language effects on labor market performance. Second, whereas most previous studies are only on males, we examine possible heterogeneous effects between males and females. This is important because the labor market is different for males and females in terms of employment, wages and working time. Therefore, the mechanism through which language skills affect labor market performance may be gender-specific. Third, it is interesting to study the effects of a small language in a small country. Dutch is the official language of only a few countries including the Netherlands, Belgium and Suriname covering a population of 28 million worldwide. Within the Netherlands almost 90% population claim to be able to converse in English (European Commission, 2005). Since for immigrants English is an option to communicate to Dutch natives, it is of particular interest to investigate to what extent Dutch language skills still matter in terms of immigrants' labor market performance.

Our paper is set up as follows. Section 2 summarizes previous studies on the topic. Section 3 discusses our data and presents some stylized facts. Section 4 presents the set-up of our analysis and discusses our parameter estimates. Section 5 confirms the robustness of our main findings through an extensive sensitivity analysis. Section 6 concludes.

2 Literature Review

Table 1 presents an overview of previous studies on language skills and labor market performance. In an early study, Dustmann (1994) uses data on immigrants in Germany and finds a positive correlation between speaking and writing proficiency and earnings. Chiswick and Miller (1995) are the first to use an IV approach to account for potential endogeneity of English fluency finding that the language premium on male immigrants' earnings is more than 20%. Similarly, Chiswick (1998) relies on an IV approach finding that using Hebrew as the primary language increases male immigrants' earnings in Israel by 35%. Among later studies, age at arrival in host countries is a commonly used instrument for language skills. Bleakley and Chin (2004, 2010) instrument language skills by the interaction of a dummy for arriving in the US before age 11 and a dummy for being born in a non-English speaking countries. Their approach is based on the assumption that non-language effects of age at arrival are the same irrespective of country of origin. They find that English proficiency increases earnings of children immigrants by 33%. Motivated by this identification strategy, Miranda and Zhu (2013b) study the language effects on immigrant-native wage gap in the UK by including male immigrants and male

natives in one sample. Budría and Swedberg (2012) and Di Paolo and Raymond (2012) use age at arrival together with other exogenous variables as instruments and find positive effects of Spanish proficiency and Catalan proficiency on earnings in Spain.

There are also a few studies on the effect of language skills but with a focus on measurement errors. Dustmann and van Soest (2001, 2002) distinguish two types of measurement errors related to the self-reporting of language skills. First, there are unsystematic measurement errors which are independent over time. Second, there are time-persistent measurement errors because individuals underestimate or overestimate their language skills. Both types of errors lead to an underestimation of the effect of language skills on labor market outcomes. The two papers rely on father's education as an exogenous variable in identification and find modest return of German skills on immigrants' earnings. Dustmann and Fabbri (2003) deal with unobserved heterogeneity by using a propensity matching estimator and use instruments to account for measurement errors. They find that English skills increase both employment and earnings of immigrants. All in all, the parameter estimates obtained from the IV approach are usually larger than OLS parameter estimates, which indicates that upward biases from other sources of endogeneity are dominated by the downward bias from measurement errors (Dustmann and van Soest, 2002; Dustmann and Fabbri, 2003; Bleakley and Chin, 2004).

3 Language skills and labor market performance

3.1 Our data

Our dataset is from the Longitudinal Internet Studies for the Social sciences (LISS) panel survey in the Netherlands. Background variables are collected monthly while there are also annual surveys on specific topics. The reference population of the LISS Panel is the Dutch speaking population permanently residing in the Netherlands.[4] We use the available 7 waves of panel data from 2008 to 2014 and focus on three indicators of labor market performance: employment, hours of work and hourly wages. An individual is considered to be employed if he or she has any type of paid work, including family business and self-employment. Respondents also report their average hours of work per week and monthly gross earnings from which we calculate hourly wages.

As all existing literature on language effects, we rely on self-reported information.

[4]Households in which no adult is able to understand survey questions in Dutch are excluded. Therefore, our analysis is representative for those who have sufficient knowledge of Dutch to answer the survey questions.

Respondents indicate language skills by answering two questions (translated in English): *When having conversations in Dutch, do you ever have trouble speaking the Dutch language?* and *When reading newspapers, letters or brochures, do you ever have trouble understanding the Dutch language?* Respondents can choose answers from *Often*, *Sometimes* and *Never*.[5] The indicator for language problems is defined as a dummy variable which equals 1 if the individual has problems in either speaking or reading, and 0 if the individual has no problem at all.

The background variables include age, gender, level of education, number of children living at home, whether one is living with a partner, whether one is living in an urbanized area and country of origin. Our baseline estimates are for first-generation immigrants, who were born outside the Netherlands by two parents both born outside the country. In a sensitivity analysis we study second-generation immigrants who were born in the Netherlands by at least one parent born outside the country. Since we study the language effects on labor market performance we restrict the sample to individuals at working age, i.e. from 15 to 64 years old. After deleting missing observations, we obtain a dataset consisting of 1831 observations of 435 individuals.

3.2 Summary statistics

Table 2 gives an overview of the characteristics of our sample split-up in four groups according to gender and the presence of language problems. For both males and females the problem with speaking Dutch is the main reason for having language problems, although many immigrants have a problem with reading as well.[6] Some characteristics of the four groups are very similar such as age, number of children and living in an urbanized area. But other background characteristics are very different. Males and females with language problems on average have a lower education, are less likely to come from a former Dutch colony and have a higher probability of being married and living with a partner. Moreover, as for the instrumental variable, immigrants with language problems generally arrive in the Netherlands 10 years later. They also have a lower probability by 30 to 40 percentage points to have spoken Dutch during childhood.

In terms of labor market performance there are clear differences among the four groups. Compared with male immigrants, females in general have a lower probability

[5] A recent study by Bloemen (2013) also refers to the two questions for language skills. Bloemen (2013) investigates how skills in Dutch affect job match and job satisfaction for immigrants rather than labor market performance.

[6] We could make a distinction between speaking problem and reading problem, but the overlap between the two groups is very large. So it makes little sense to estimate the effects of each problem separately.

of being employed, work for fewer hours per week and have lower hourly wages. Females with language problems have a lower employment probability by almost 10 percentage points, less working time by 3 hours per week, and lower hourly wages by almost 2 euro. For male immigrants there is hardly any difference in labor market performance by the presence of language problems. The employment probability and hours of work are almost the same. Only in terms of hourly wages there is a gap of 2.7 Euro if one has language problems.

3.3 Stylized facts

Figure 1 shows kernel density plots of weekly hours of work for female immigrants and male immigrants by the presence of language problems. For female immigrants there is a clear relationship between language problems and hours of work. Female immigrants with language problems are more likely to work part-time than female immigrants without language problems. Among male immigrants there are no big differences. Work is much more concentrated on 40 hours per week. Most men have a full-time job regardless of language skills. Similarly, Figure 2 shows kernel density plots of (log) hourly wages by the presence of language problems. Immigrants with language problems have lower average hourly wages than immigrants without language problems. This is true for both males and females, but the gap is larger for females than males.

In Figure 3, we compare the pattern of age at immigration for females and males. We do not find much difference by gender. It is sometimes argued that females arrive later in host countries as a consequence of family reunion or family formation whereas males mainly immigrate for work or education.[7] We have no information on the reason for immigration, but Figure 3 suggests that immigration patterns of females and males are very much alike.

In Figure 4 we illustrate the relationship between language problems and age at arrival. We distinguish between immigrants who spoke Dutch at childhood and those who did not do so. For the first group the probability of having language problems at adulthood hardly increases with age at arrival before the age of 25 years old. But the probability sharply increases with age at arrival for immigrants who did not speak Dutch during childhood. Taking advantage of the differences in age-at-arrival effects on language skills between the two groups, we instrument language problems by the interaction of age at arrival and a dummy for whether one grew up speaking Dutch.

[7] Dustmann and van Soest (2002) argue that the mechanism through which females acquire language skills is different from males. Females may often have entered a country as a dependent family member.

4 Empirical analysis

4.1 Set-up of the analysis

We start our analysis with OLS estimates assuming that measurement errors are absent and language problems are exogenous to labor market performance:

$$Y_{it} = X_{it}\beta + \gamma L_{it} + \delta_t + \varepsilon_{it} \tag{1}$$

where Y_{it} denotes an indicator for labor market performance. The first indicator is a dummy variable for whether an individual is employed or non-employed, i.e. unemployed or out of the labor force. The second indicator is the natural logarithm of hours of work conditional on being employed. The third indicator is the natural logarithm of hourly wages conditional on being employed. Furthermore, X_{it} refers to time-varying background characteristics, including age, number of children at home, living with a partner and living in an urbanized area, and time-invariant variables such as education and country of origin fixed effects. L_{it} refers to the dummy variable for language problems and δ_t represents calendar year fixed effects. Finally, β is a vector of parameters, γ is the parameter of main interest representing the effect of language problems on labor market performance and ε_{it} is the error term. To account for multiple observations per individual we cluster the standard errors at the level of individual.

The assumptions of exogeneity of language problems and absence of measurement errors underlying the OLS estimates may lead to biased parameter estimates. Firstly, unobserved heterogeneity may be correlated with both labor market performance and language skills. For instance, more motivated immigrants will make a greater effort to learn Dutch and at the same time they are more likely to be employed and have higher earnings. Secondly, labor market performance reversely contributes to the proficiency in Dutch, since immigrant employees have more intense interaction with local society and are more likely to afford Dutch training courses. Thirdly, all indicators about language problems are self-reported and suffer from measurement errors. Unobserved heterogeneity and reverse causality lead to an upward bias in the parameter estimate of the language effects while measurement errors lead to a downward bias.

To correct for these potential biases, we use an instrumental variable approach similar to Bleakley and Chin (2004, 2010). In the baseline estimates to explain language problems L_{it}, we use one instrumental variable defined as the interaction between age at arrival A_i and a dummy variable S_i indicating whether or not an immigrant spoke Dutch during

childhood:

$$L_{it} = X_{it}\beta_1 + \theta S_i \times A_i + \delta_{1t} + \varepsilon_{1it} \tag{2}$$

As before, the δ's are calendar year fixed effects, β_1 is a vector of parameters, θ is a parameter and ε_{1it} is an error term. According to Figure 4, age at arrival has strong effects on language problems only for immigrants who spoke non-Dutch languages during childhood. So we instrument L_{it} by $S_i \times A_i$, the interaction of age at arrival and a dummy for growing up speaking other languages. The validity of our instrument requires that non-language age-at-arrival effects on labor market performance are the same for two types of immigrants: those who spoke Dutch during childhood and those who did not. However, there is a possible violation of the assumption when two types of immigrants experience different assimilation trajectories. We add country of birth fixed effects to control for some non-language channels, but it is possible that immigrants who arrive at an earlier age assimilate faster and less costly than their counterparts from the same country who arrive later. For example, age at arrival has an association with intermarriage which can be viewed as a non-language determinant of earnings. Aslund et al. (2009) find that immigrants who arrive in Sweden at a later age are more likely to have an immigrant spouse. There are also findings that immigrants with a native spouse have higher earnings (Meng and Gregory, 2005; Meng and Meurs, 2009). The studies interpret this "intermarriage premium" as a reward for economic assimilation.

To investigate the robustness of our findings with respect to the assumption on age at arrival we perform two types of sensitivity analysis. First, we introduce age at arrival as an additional instrument. This allows for age-at-arrival effects on the language channel for immigrants who spoke Dutch during their childhood. Second, we introduce age at arrival as a right-hand side control variable in the labor market performance equations. So we take into account that age at arrival can affect labor market performance directly through non-language channels.

4.2 Parameter estimates

Table 3 shows the OLS parameter estimates for the effect of language problems on different labor market outcomes. Not many of the relevant language problems parameters are significantly different from zero. Having language problems reduces the probability of being employed for female immigrants by 12.5 percentage points and reduces the hourly wages for male immigrants by 13.8%. But language problems are not associated with

other labor market performance indicators. Most of the parameter estimates on control variables are not statistically significant from zero but some are. Age affects employment probability positively before 42-43 years old but negatively after the turning point for both males and females. Higher education generally has positive effects on the probability of being employed and earning higher hourly wages. Having more children at home is associated with a lower probability of employment for females. Compared with immigrants born in western countries, female immigrants from Turkey and Morocco work for fewer hours and male immigrants from the two countries have a lower employment probability. Finally, male immigrants from other non-western countries have lower hourly wages and fewer hours of work than immigrants from western countries.

The first two columns of Table 4 report the determinants of language problems for females and males as the first stage of the 2SLS estimation. The instrumental variable has a strongly significant effect on language problems. Arriving in the Netherlands one year later would increase the probability of having language problems by 1.8% for female immigrants who grew up speaking a different language from Dutch. The effect of the instrumental variable on language problems is very similar for male immigrants. Compared with the lowest level of education, intermediate secondary education or higher strongly decreases the probability of having Dutch language problems. Female immigrants from Turkey/Morocco, Antilles/Suriname/Indonesia, and other non-western countries are more likely to have language problems than female immigrants from western countries. Male immigrants from Turkey or Morocco also have significant disadvantage in Dutch proficiency. Having more children at home improves Dutch proficiency, because parents can benefit from children attending local schools. Age, living with a partner and living in an urbanized area are not associated with Dutch language skills.

Columns (3) to (8) of Table 4 provide 2SLS parameter estimates and related test statistics.[8] The first test-statistic is the F-test on the relevance of the instrumental variable. Estimates can be biased with weak instruments. As a rule of thumb an F-statistic exceeding 10 is thought to be in the "safe zone" (Angrist and Pischke, 2009). Second, we perform a Durbin-Wu-Hausman test for endogeneity of language problems. When the F-statistic is significantly different from 0, the language indicator is assumed to be endogenous.

According to Table 4 the parameter estimates on the control variables are very similar as in Table 3. Language problems have significantly negative effect on hourly wages for female immigrants by about 48%, but no effect on female immigrants' hours of work.

[8]These estimates are obtained through the ivreg2-routine in STATA.

Female immigrants' employment is also lower in the presence of language problems by about 22 percentage points, but the effect is not significant at a significance level of 10% with a t-statistic of 1.64. For male immigrants, none of the labor market indicators are significantly affected. Male immigrants with language problems on average earn about 9% less than male immigrants without language problems. In all estimates the F-statistics for the instrumental variable are very high indicating that our estimates do not suffer from weak instruments. The endogeneity test statistic is significant only for the log hourly wages of female immigrants, which indicates that in other regressions we cannot reject the hypothesis that the language problem indicator is exogenous to the labor market performance indicator. Comparing Table 4 with Table 3, we find that in females' wage regression our 2SLS parameter estimate on language effects are most often larger than the OLS parameter estimate. This suggests that the downward bias from measurement errors dominates the potential upward biases from other sources of endogeneity.

5 Sensitivity analysis

In this section, we present several sensitivity checks to investigate the robustness of our findings. Up to now we instrument language problems using only one instrumental variable defined as the interaction between age at arrival and a dummy variable indicating whether or not an immigrant spoke Dutch. This implies that only for immigrants who grew up speaking non-Dutch languages there is an age-at-arrival effect on language problems. However, we cannot rule out that arriving early in the Netherlands also contributes to language proficiency for immigrants who spoke Dutch during their childhood (see Figure 4). In a first sensitivity check we add age at arrival as an additional instrumental variable. Although we have to further assume that age at arrival does not affect labor market through other channels than language, it is possible to test whether two instruments are exogenous to the error terms.[9] Panel *a* of Table 5 shows the language skills parameter estimates by using two instruments. They are similar in size to the baseline estimates presented in Table 4. Language problems reduce hourly wages by 41% and employment probability by 20 percentage points for female immigrants at 10% level, while there is no language effect on male immigrants' labor market performance. The Hansen J-statistics indicate that in all regressions except for the language effect on males' employment, we cannot reject the null hypothesis that both instruments are exogenous to labor outcomes. Therefore, adding an additional instrument yields robust and consistent

[9] We use Hansen J-test for overidentifying restrictions. The Hansen J-statistic follows a χ^2-distribution with one degree of freedom.

coefficients.

Panel *b* of Table 5 shows the relevant parameter estimates when we include age at arrival not as an instrumental variable but as an exogenous right-hand side variable in the labor market performance equations. This is to control the direct effects of age at arrival on labor market performance independent of channels through language skills, still maintaining the assumption that the direct non-language effects are the same between two types of immigrants. The parameter estimates of language problems are affected by this, but our findings do not change substantially. Language problems only have a significant negative effect on the hourly wages of female immigrants, and the estimate is not statistically different from the baseline estimate. Except for hourly wages of female immigrants the main parameter estimates are similar with Table 4 by including age at arrival as a right-hand side variable. So it seems that the effect of age at arrival on labor outcomes is rather limited through other channels than language problems.

In the following sensitivity check we restrict to the prime-aged sample from 25 to 54 years old, since they are more relevant to policy analysis of labor market outcomes. The findings are very much the same. Language problems have significantly negative effects on female immigrants' hourly wages by 56%, which means that language effects are stronger on prime-aged female immigrants. And again there are no significant effects for male immigrants.

In the last sensitivity check we introduce second-generation (SG) immigrants in the analysis. They have a better labor market position than first-generation (FG) immigrants in the sense that they were educated in the same system as native Dutch and have less language problems. By including the SG immigrants dummy we can separate the language effect from the effects of immigrant status.

$$Y_{it} = X_{it}\beta + \theta FG_i + \gamma FG_i \times L_{it} + \delta_t + \varepsilon_{it} \tag{3}$$

In the equation we include a dummy for FG immigrant status FG_i and its interaction with language problems, $FG_i \times L_{it}$. We do not include the language variable L_{it} as a separate variable because only as few as 12% SG immigrants have language problems and we can treat all SG immigrants as the reference group. So we have only one endogenous variable $FG_i \times L_{it}$, and its coefficient γ measures the effects of language problems on FG immigrants compared with the reference group. The OLS parameter estimates show that female FG immigrants without language problems have a lower employment probability by 8 percentage points than SG female immigrants, while language problems are associated with an additional decrease of 12 percentage points. We also use the baseline

instrumental variable for $FG_i \times L_{it}$ and find that FG immigrant status has no significant effect on labor market performance under all regressions. The effects of language problems on FG immigrants are very similar to what we find in the baseline. Therefore, we conclude that it is language problems, rather than first-generation immigrant status that explains the gap in labor market performance between two types of immigrants.

In an unreported sensitivity analysis, we estimated the effects of language performance on other labor market performance indicators. First, we excluded the immigrants who do not participate in labor force to calculate the employment probability conditional on being active in labor market. The 2SLS parameters of the language effects are very similar to Column (3) and (4) in Table 4. Language problems significantly lower females' employment by 29 percentage points, but do not affect males' employment. We also used the natural logarithm of gross monthly earnings as a substitute for hourly wages, finding very similar parameter estimates.

In a further unreported sensitivity analysis, we investigated whether there is a sample selection bias. Information on earnings and hours of work is only available for the employed individuals who are willing to report. It could be that unobserved characteristics affect employment and hours of work/hourly wages at the same time. For example, immigrants with better language skills may be self-selected into employment and reporting hourly wages at the same time they earn higher wages. However, we find no evidence of a sample selection bias.[10]

6 Conclusions

We analyze the recent labor market performance of immigrants in the Netherlands focusing on their Dutch language problems, i.e. problems to read or speak Dutch. We find that female immigrants with language problems have substantial lower wages by

[10]We first ran a probit regression on the selection indicator which equals to 1 if hours of work/hourly wages information is available. The exogenous variables that determines selection but does not appear in wage equation are religion dummies, marital status dummies, female-male ratio of labor participation and female-male ratio of tertiary education in the country of birth during the decade of immigration. The last two variables are calculated based on data from World Bank, motivated by Miranda and Zhu (2013a). Theses variables can measure the tradition and values on labor division of gender, but not influence labor market in the Netherlands. Although we cannot rule out that the excluded variables have direct effects on earnings, this seems unlikely to be the case. Then we use the inverse Mill's ratio obtained from the probit regression as an exogenous variable in the 2SLS estimation (Wooldridge, 2002). The excluded variables in the first stage are jointly significant, but the inverse Mill's ratio does not play a role in the 2SLS estimation. The corrected 2SLS estimates for the language effects on hours of work and hourly wages are not statistically different from our baseline. Miranda and Zhu (2013a) address the sample selection issue for female immigrants by using a 3-step selection model and also find that the corrected estimates do not differ from the 2SLS estimates too much.

48% than female immigrants with similar personal characteristics but without language problems. Language problems have no effects on employment and working time. For male immigrants Dutch language skills seem to be less important. Male immigrants with language problems have the same employment probability and hours of work as male immigrants without language problems. And the hourly wages of male immigrants with language problems are not significantly different from male immigrants without language problems.

Our main conclusions from the analysis are threefold. Firstly, we find heterogeneous language skills effects by gender. It may be that female immigrants are more affected by language problems than male immigrants because female labor supply is more sensitive to human capital. Females with worse language skills are more likely to stay unemployed or if they enter the labor market they do not to qualify for well-paid jobs. Males have no choice but to seek better jobs as they are often the breadwinners of the family no matter of whether or not they have a good command of Dutch. It could also be that gender differences are related to the type of jobs that men and women occupy. Females are more likely to conduct non-manual work and have a job in industries where language proficiency is important. Males, however, conduct manual work and work in industries where communication in Dutch is not very important. In our sample of employed workers about 80% of the female immigrants and 55% of the male immigrants are doing non-manual work. Similarly, almost 80% of the female immigrants and roughly half of the male immigrants are working in industries which require language skills, such as business services, public administration, education, health care and so on. Secondly, comparing our findings with previous studies, the magnitude of effects of Dutch language skills on earnings are smaller than the world-wide spoken languages, such as English and Spanish. We find that Dutch language skills have no significant effect on males' labor market performance, in contrast to previous papers where language skills have positive effects on male immigrants' earnings up to more than 30%. This provides some evidence that immigrants with limited skills in regional European languages are not disadvantaged. A speculative interpretation is that this may have to do with English language proficiency which is widely present among the Dutch population. This makes communication between natives and English speaking immigrants easier. We cannot test this because we do not have information on English proficiency. However, English seems to be an alternative to Dutch for immigrants in the labor market. Lastly, to the extent that immigrants are negatively affected by lack of language skills, this is indeed related to these skills and not to their immigrant status.

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Table 1: Previous Studies on Language Skills and Labor Market Performance

Reference	Topic and Country	Type of data	Identification Method	Results
Dustmann (1994)	Effect of German proficiency on earnings in Germany	Cross-sectional data of immigrants from GSOEP survey	OLS with Heckman selection method	Speaking proficiency in German on earnings: 7% for men and women; writing proficiency: 7% for men and 15% for women.
Chiswick and Miller (1995)	Effect of English fluency on earning in Australia	Cross-sectional data of male immigrants from 1981 and 1986 Census of Australia	2SLS; IVs are a dummy for overseas marriage, number and age of children, and minority concentration measure; check selection bias of entering language-fluent labor market	English fluency on earning: OLS 5%, 2SLS 24% insignificant
Chiswick (1998)	Effect of Hebrew usage on earnings in Israel	Cross-sectional data of male immigrants from 1983 Israel Census	2SLS; IVs are a dummy for married prior to immigration to current spouse, a dummy for living with children, and minority concentration measure	Hebrew as a primary language on earning: OLS 11%, 2SLS 35%
Dustmann and van Soest (2001)	Effect of German fluency on earnings in Germany	Panel data of male immigrants from GSOEP survey	Ordered probit; simultaneous equations for mis-specification error; random effects for unobserved heterogeneity; father's education as an exogenous variable	German fluency on earning: 0.9-7.3%
Dustmann and van Soest (2002)	Effect of German skills on earnings in Germany	Panel data of immigrants from GSOEP survey	matching type OLS estimation and 2SLS estimation with IVs; IVs are leads and lags of language skills and father's education	Speaking fluency in German on earnings: OLS 5% for men and 4% for women, IV 14% for mean and 12% for women
Dustmann and Fabbri (2003)	Effect of English skills on employment probability and earning in UK	Cross-section data of immigrants from FNSEM and FWLS survey	Propensity score estimator with IVs ethnic minority concentration and number of children	English speaking on employment: OLS 17%, propensity matching 10%, propensity matching with IV 22%; English speaking on earning: OLS 18%, propensity matching 28%, propensity matching with IV 36%
Bleakley and Chin (2004)	Effect of English proficiency on earning in US	Cross-sectional data of child immigrants from US Census 2000	2SLS; IV is (0, age at arrival - 11)$\times$ a dummy for born in non-English speaking countries	English proficiency on earning: OLS 22%, 2SLS 33%
Bleakley and Chin (2010)	Effect of English proficiency on social assimilation in US	Cross-sectional data of child immigrants from US Census 2000	2SLS; IV is (0, age at arrival - 9)$\times$ a dummy for born in non-English speaking countries	Immigrants with better English proficiency have more education, higher earnings, higher chance of intermarriage, fewer children and higher chance of living in ethnic enclaves.
Budría and Swedberg (2012)	Effect of Spanish proficiency on earning in Spain	Cross-sectional data of male immigrants from ENI survey	2SLS; IVs are dummies for arriving in Spain before 10, having a child who is proficient in Spanish and planning to stay in Spain for next 5 years	Spanish proficiency on earning: OLS 5%, 2SLS 27%
Di Paolo and Raymond (2012)	Effect of Catalan proficiency on earnings in Spain	Cross-sectional data of immigrants from EHCV06 survey	2SLS and endogenous switching model; IVs dummies arriving before age 11, $>$ 100 books at home, reading frequently, speaking Catalan at home, watching Catalan news and reading Catalan newspapers, neighborhood % speaking Catalan	Catalan proficiency on earnings: OLS 8%, endogenous switching model 18%
Miranda and Zhu (2013a)	Effect of English deficiency on wage gap in UK	Cross-sectional data of female immigrants from UKHLS	2SLS and a three-step estimator for sample selection; IV is (0, age at arrival - 9)$\times$ a dummy for born in non-English speaking countries	Speaking English as an additional language on wage: OLS -19%, 2SLS -28%, 3-step -25%
Miranda and Zhu (2013b)	Effect of English deficiency on wage gap in UK	Cross-sectional data of immigrants from UKHLS	2SLS; IV is (0, age at arrival - 9)$\times$ a dummy for born in non-English speaking countries	Speaking English as an additional language on wage: OLS, -16%, 2SLS, -23% or -25%

Table 2: Sample characteristics by gender and language problems

	Females		Males	
Any language problems	No	Yes	No	Yes
Speaking problems (%)	–	91.1	–	91.7
Reading problems (%)	–	77.4	–	76.4
Personal characteristics				
Age	42.9	42.5	45.0	44.2
Education (%)				
Primary education	7.1	15.0	8.0	20.3
Lower secondary education	19.7	18.8	21.4	21.5
Intermediate secondary education	38.0	34.3	41.4	29.2
Higher education	35.1	31.9	29.3	28.9
Number of children at home	1.3	1.2	1.1	1.3
Living with a partner (%)	67.8	73.3	70.5	72.6
Living in urbanized areas (%)	58.7	55.8	59.8	61.1
Marital status (%)				
Married	52.3	68.7	58.9	69.0
Divorced/Separated	11.7	9.3	14.3	12.7
Widowed	2.2	6.1	0.0	1.8
Single	33.8	15.8	26.8	16.5
Country of origin (%)				
Turkey, Morocco	12.2	23.0	16.1	24.7
Antilles, Suriname, Indonesia	34.2	18.0	32.7	14.2
Other non-western countries	11.9	24.0	13.9	31.9
Other western countries	41.7	35.0	37.3	29.2
Age at arrival	14.9	24.6	15.0	24.4
Spoken Dutch during childhood (%)	58.3	22.2	65.0	23.9
N	547	505	440	339
n	148	156	126	105
Labor market Indicators				
Employment probability (%)	54.3	44.4	74.8	73.5
N	547	505	440	339
Hours of work per week	31.9	28.6	38.8	37.8
N	226	160	253	196
Hourly wages (Euro)	17.0	15.0	19.8	17.1
N	206	146	235	172

Note: The level of education dummy variables are based on Statistics Netherlands categories: primary education, lower secondary education (VMBO), intermediate secondary education (HAVO/VWO/MBO), university or higher education (HBO/WO). In an urbanized area population density is above 1500 inhabitants per squared kilometer. N is the number of observations; n is the number of individuals.

Table 3: OLS parameter estimates

	Employment		Log hours of work		Log hourly wages	
	Females	Males	Females	Males	Females	Males
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Language problems	-0.125**	0.018	-0.121	-0.006	-0.079	-0.138*
	(0.055)	(0.050)	(0.088)	(0.039)	(0.077)	(0.072)
Age	0.080***	0.118***	0.001	0.027	0.010	0.039
	(0.014)	(0.015)	(0.037)	(0.026)	(0.034)	(0.037)
Age squared/100	-0.095***	-0.137***	-0.012	-0.027	0.001	-0.034
	(0.018)	(0.018)	(0.043)	(0.027)	(0.040)	(0.042)
Lower secondary	0.010	0.072	-0.305*	0.012	-0.023	-0.032
education	(0.108)	(0.113)	(0.174)	(0.103)	(0.133)	(0.129)
Intermediate secondary	0.093	0.185*	-0.075	-0.020	0.038	0.170
education	(0.094)	(0.095)	(0.133)	(0.099)	(0.122)	(0.114)
Higher education	0.171*	0.146	-0.032	-0.042	0.264**	0.415***
	(0.102)	(0.107)	(0.132)	(0.124)	(0.117)	(0.141)
Number of children at home	-0.049*	0.012	0.040	0.015	0.027	0.014
	(0.025)	(0.023)	(0.055)	(0.027)	(0.044)	(0.049)
Living with a partner	0.097	0.097	-0.120	0.077	-0.067	0.012
	(0.061)	(0.069)	(0.081)	(0.060)	(0.078)	(0.102)
Living in an urbanized area	-0.014	-0.097*	0.064	-0.020	0.077	0.154
	(0.059)	(0.050)	(0.078)	(0.052)	(0.070)	(0.111)
Turkey, Morocco	0.078	-0.165**	-0.294**	-0.017	0.062	-0.129
	(0.091)	(0.077)	(0.117)	(0.052)	(0.131)	(0.097)
Antilles, Suriname	0.082	0.016	0.139	0.056	0.068	-0.160
and Indonesia	(0.080)	(0.073)	(0.101)	(0.054)	(0.083)	(0.132)
Other non-western countries	-0.004	-0.085	0.077	-0.170**	-0.053	-0.274*
	(0.083)	(0.077)	(0.114)	(0.085)	(0.115)	(0.145)
Observations	1,052	779	386	449	352	407

Note: Language problems are defined as having either speaking or reading problems; absolute t-statistics based on clustered standard errors in parentheses. All the estimates include year fixed effects. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: 2SLS parameter estimates

	Language problems		Employment		Log hours of work		Log hourly wages	
	Females	Males	Females	Males	Females	Males	Females	Males
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Language problems	–	–	-0.221	-0.098	-0.062	0.125	-0.479***	-0.094
			(0.135)	(0.116)	(0.169)	(0.123)	(0.179)	(0.191)
Age at arrival × Spoke other	0.018***	0.019***	–	–	–	–	–	–
languages during childhood	(0.002)	(0.002)	–	–	–	–	–	–
Age	0.015	0.008	0.083***	0.120***	0.001	0.023	0.024	0.037
	(0.015)	(0.018)	(0.015)	(0.015)	(0.037)	(0.026)	(0.041)	(0.037)
Age squared/100	-0.025	-0.014	-0.098***	-0.139***	-0.011	-0.022	-0.017	-0.032
	(0.018)	(0.020)	(0.018)	(0.018)	(0.043)	(0.028)	(0.049)	(0.042)
Lower secondary	-0.129	-0.160	-0.009	0.052	-0.301*	0.024	-0.044	-0.027
education	(0.078)	(0.107)	(0.113)	(0.118)	(0.170)	(0.104)	(0.141)	(0.127)
Intermediate secondary	-0.205***	-0.234**	0.071	0.150	-0.059	0.025	-0.064	0.186
education	(0.066)	(0.095)	(0.100)	(0.104)	(0.141)	(0.113)	(0.134)	(0.122)
Higher education	-0.260***	-0.232**	0.148	0.120	-0.014	0.001	0.153	0.430***
	(0.076)	(0.094)	(0.104)	(0.112)	(0.146)	(0.132)	(0.132)	(0.146)
Number of children at home	-0.038*	-0.017	-0.053**	0.014	0.042	0.014	0.006	0.013
	(0.021)	(0.026)	(0.026)	(0.023)	(0.054)	(0.027)	(0.047)	(0.047)
Living with a partner	0.026	0.017	0.103*	0.094	-0.126	0.078	-0.035	0.012
	(0.055)	(0.063)	(0.061)	(0.070)	(0.080)	(0.062)	(0.095)	(0.099)
Living in an urbanized area	-0.064	-0.002	-0.018	-0.096*	0.062	-0.017	0.100	0.154
	(0.052)	(0.053)	(0.058)	(0.049)	(0.076)	(0.052)	(0.076)	(0.109)
Turkey, Morroco	0.226***	0.176**	0.093	-0.149*	-0.301***	-0.040	0.146	-0.137
	(0.076)	(0.083)	(0.091)	(0.077)	(0.116)	(0.057)	(0.138)	(0.103)
Antilles, Suriname	0.157**	0.087	0.073	-0.000	0.148	0.074	0.004	-0.155
and Indonesia	(0.075)	(0.076)	(0.079)	(0.075)	(0.095)	(0.059)	(0.099)	(0.127)
Other non-western countries	0.257***	0.093	0.017	-0.057	0.069	-0.216**	-0.002	-0.289*
	(0.068)	(0.084)	(0.081)	(0.080)	(0.118)	(0.102)	(0.129)	(0.160)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Test for Weak Instruments	–	–	88.2***	62.0***	23.5***	33.5***	20.0***	35.2***
Endogeneity Test	–	–	0.7	1.4	0.2	1.5	5.7**	0.1
Observations	1,052	779	1,052	779	386	449	352	407

Note: Language problems are defined as having either speaking or reading problems; absolute t-statistics based on clustered standard errors in parentheses. All the estimates include year fixed effects. *** p<0.01, ** p<0.05, * p<0.1.

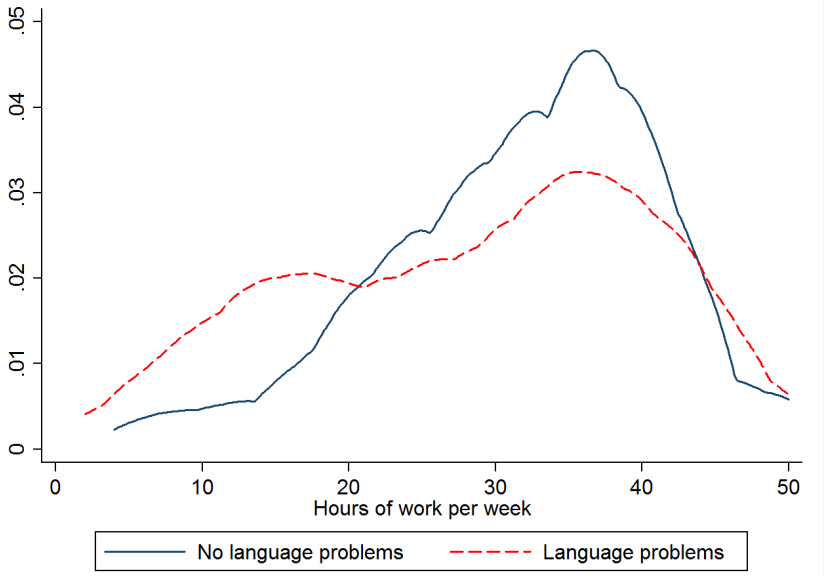
Table 5: Sensitivity analysis

Variables	Employment Females (1)	Employment Males (2)	Log hours of work Females (3)	Log hours of work Males (4)	Log hourly wages Females (5)	Log hourly wages Males (6)
a. Using two instrumental variables						
Language Problems	-0.203*	-0.011	-0.053	0.107	-0.411***	-0.158
	(0.123)	(0.103)	(0.157)	(0.106)	(0.158)	(0.191)
Test for Weak Instruments	70.2***	50.2***	14.6***	25.0***	12.6***	23.2***
Endogeneity Test	0.6	0.1	0.3	1.3	5.1**	0.0
Hansen J-statistic	0.1	3.4*	0.0	0.2	1.1	1.4
Observations	1052	779	386	449	352	407
b. Age of arrival RHS variable						
Language problems	-0.295	-0.313	-0.098	0.168	-0.738***	0.094
	(0.297)	(0.192)	(0.307)	(0.207)	(0.361)	(0.278)
Test for Weak Instruments	12.6***	21.6***	9.4***	12.8***	7.7***	15.7***
Endogeneity test	0.4	2.8*	0.0	1.1	3.1*	0.7
Observations	1052	779	386	449	352	407
c. Restricted sample at prime age						
Language Problems	-0.231	0.061	-0.085	0.148	-0.560***	-0.042
	(0.172)	(0.096)	(0.190)	(0.141)	(0.207)	(0.154)
Test for Weak Instruments	46.9***	47.1***	15.8***	31.7***	12.5***	25.4***
Endogeneity Test	0.6	0.1	0.0	1.5	4.8**	0.4
Observations	761	554	317	358	284	328
d. Pooled sample with second-generation immigrants						
OLS:						
Language problems×	-0.120***	-0.007	-0.108**	0.006	-0.071	-0.145***
FG immigrant status	(0.029)	(0.028)	(0.050)	(0.033)	(0.047)	(0.047)
FG immigrant status	-0.080***	0.040	0.062	-0.045	-0.056	0.062
	(0.030)	(0.028)	(0.048)	(0.032)	(0.045)	(0.047)
2SLS:						
Language problems×	-0.241*	-0.121	-0.020	0.152	-0.440**	-0.153
FG immigrant status	(0.135)	(0.121)	(0.180)	(0.127)	(0.184)	(0.193)
FG immigrant status	-0.031	0.082	0.028	-0.100	0.089	0.064
	(0.079)	(0.063)	(0.103)	(0.078)	(0.103)	(0.085)
Test for Weak Instruments	78.3***	70.4***	21.1***	35.9***	19.1***	37.5***
Endogeneity Test	1.0	1.3	0.3	1.7	4.7**	0.0
Observations	2,086	1,612	819	876	722	776

Note: Language problems are defined as having either speaking or reading problems; absolute t-statistics based on clustered standard errors in parentheses. All estimates have the same explanatory variables including year fixed effects as Tables 3 and 4. *** p<0.01, ** p<0.05, * p<0.1.

FIGURE 1: KERNEL DENSITY PLOTS OF HOURS OF WORK

a. Female immigrants



b. Male immigrants

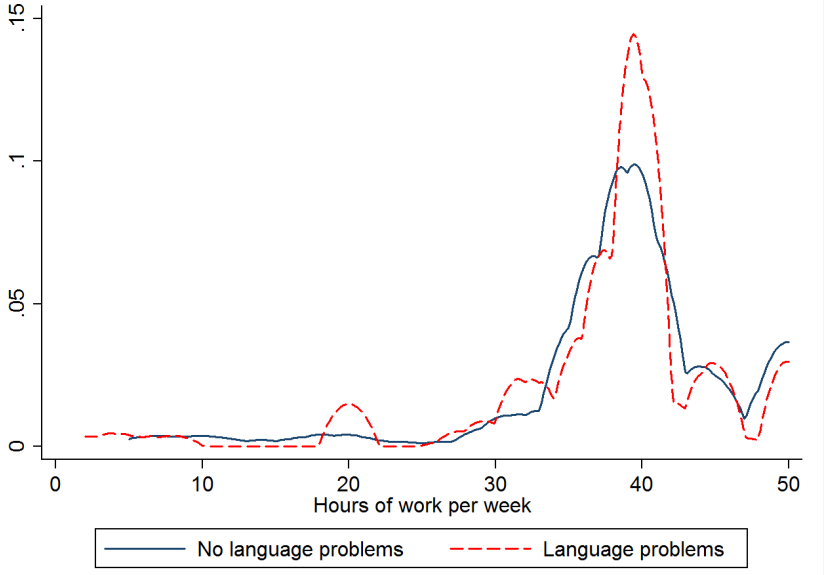
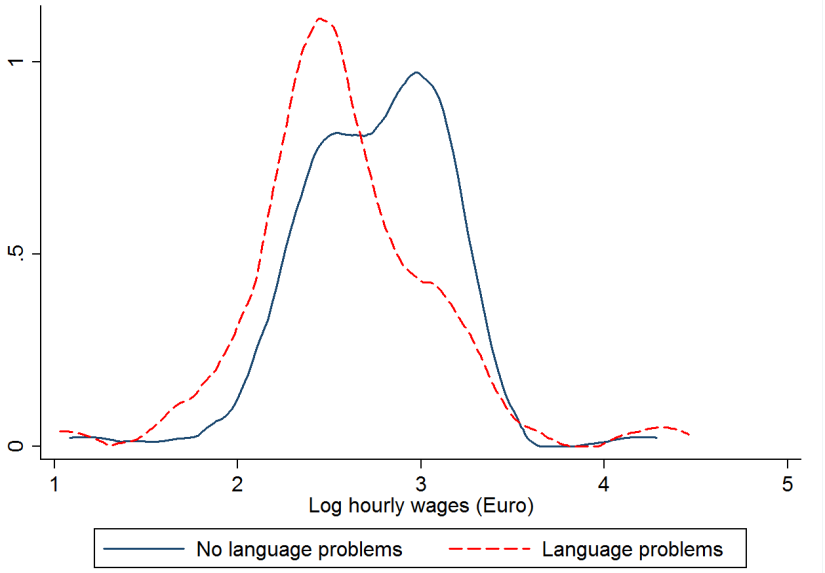


FIGURE 2: KERNEL DENSITY PLOTS OF LOG HOURLY WAGES

a. Female immigrants



b. Male immigrants

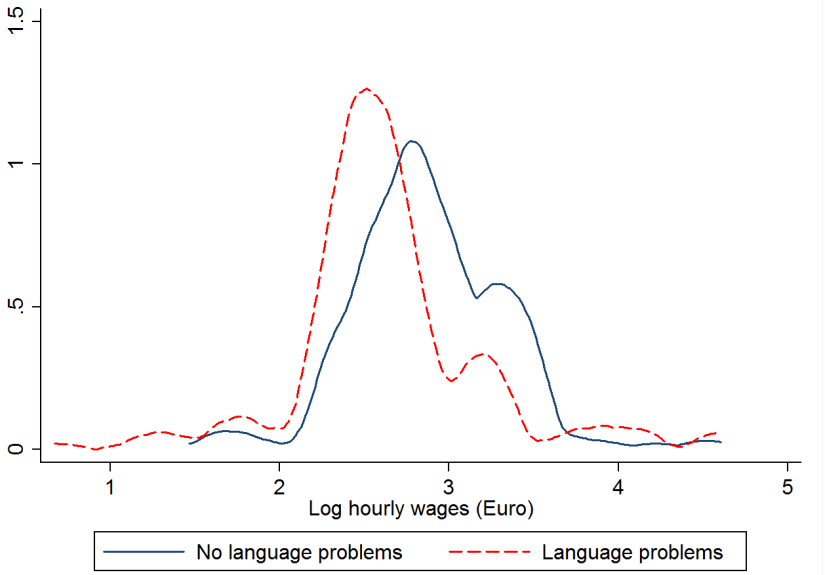


Figure 3: Kernel density plots of age at arrival

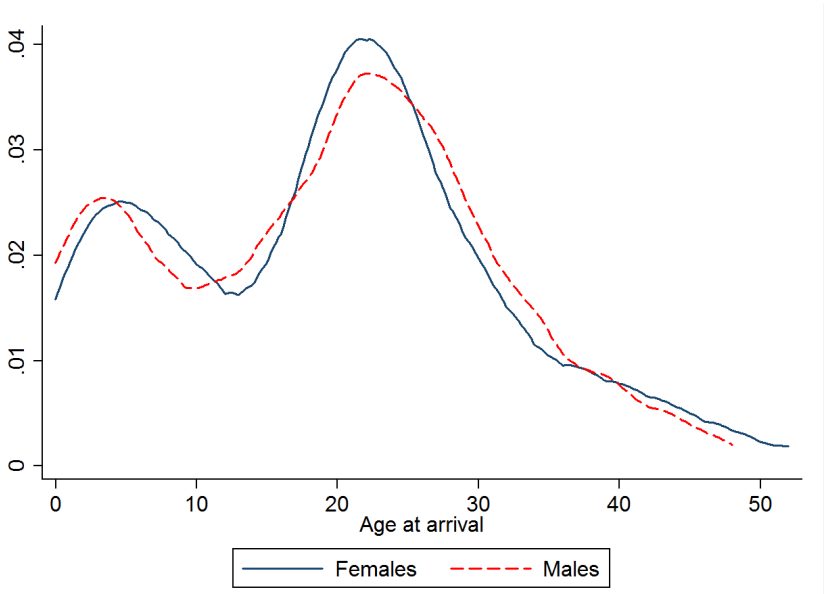


Figure 4: Probability of having language problems and age at arrival