Extended abstract

Beyond the *Healthy Immigrant Paradox*: decomposing differences in birthweight among immigrants in Spain

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Context and aims of the study

The *Healthy Immigrant Paradox* refers to the phenomenon observed in many countries suggesting that immigrants who have just moved to a receiving country have better health outcomes and, consequently, lower death rates than the native population. This phenomenon has been rightly considered 'paradoxical', as migrants are more exposed to adverse conditions that should take an immediate toll on their health. There is also some evidence showing better health outcomes among immigrant children when compared to natives in terms of birthweight, infant mortality rates and premature birth despite their much poorer conditions (Markides and Rote, 2015). Nevertheless, systematic cross-country analyses provide very divergent evidence (Juárez and Hjern, 2017; Urquia *et al.*, 2016; Gagnon *et al.*, 2009) Results vary depending on receiving country, maternal origins and specific outcomes (LBW, infant mortality, preterm birth).

To date available data for Spain seem to confirm the healthy immigrant pattern. The estimation of differences between native and immigrant-born babies in terms of weight shows that the latter systematically weigh more (Cebolla-Boado and Salazar, 2016; Juárez *et al.*, 2017; Urquia *et al.*, 2015). Nevertheless, there is still much to learn about factors that determinate this phenomenon. To date the research on patterns and determinants of birthweight has been limited by the scarcity of data. Researchers have usually used data from Vital Statistics (Estadistica del Movimiento Natural de la Población) provided by the Spanish National Statistics Office (INE) which offer basic variables regarding the characteristics of new-born babies and their parents. Nevertheless, these data do not provide more specific social data, such as time residing in Spain or socio-economic status of the household. Our research takes advantage of recently released data which link information from Vital Statistics (2011-2015) with data from the 2011 Spanish Census. These data offer an opportunity to analyse in greater depth the factors that influence differences between the native and immigrant population in terms of birthweight.

In this research we aim to describe and analise perinatal health in terms of birthweight. We analyse the extent to which differences in birthweight are determined by disparities in the composition of immigrant groups from different origins. We compare the composition of the main immigrant groups in order to identify traits that determine

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differences in birthweight. In other words, we estimate the extent to which differences in birthweight among specific origins are due to uneven distribution of relevant characteristics and the extent to which those disparities are determined by other, unspecified factors.

Determinants of birthweight

Several explanations for the *Healthy Immigrant Paradox* have been provided. For instance, the *Ethnic Maintenance Hypothesis* suggests that inner-group social control and maintenance of social ties, norms and lifestyles may be protective for immigrants and their offspring which may positively influence their health outcomes (Luthra et al., 2018). It has also been suggested that several unobserved or confounding factors (diabetes, smoking) may be in play (Brown et al., 2007). One of the most popular explanations of the paradox is the *Immigrant Selectivity Hypothesis*. This explanation is based on the assumption that immigrants are not a random sample of their home country population. Those who choose to undertake the move may differ from the home country population and this selection may occur on many observable and unobservable traits, including socio-economic characteristics, and health (Riosmena et al., 2017).

From a strictly empirical point of view, there is a vast body of research that identifies several factors that have a significant impact on immigrant birthweight. There is evidence that socio-economic status, in terms of educational attainment and occupational position, has a positive impact on the health of mothers and their siblings through work and economic conditions, psycho-social resources and health lifestyle (Ichou and Wallace, 2019; Štípková, 2016; Adler and Newman, 2002).

Sow et al. (2019) showed that adopting Belgian nationality has a favourable effect on birth outcomes. Several studies have also provided evidence of an association between marital status and birth outcomes. More specifically, it has been reported that single mothers face worse economic circumstances, experience greater psychological stress during pregnancy, and are less likely to seek timely prenatal care when compared to other mothers, all of which increases the risk of low birthweight (Castro-Martín, 2010). As for the impact of time of residence in the host country, the available evidence is ambiguous and rather complex. Teiler et al. (2017) showed there was a systematic reduction of average birthweight during first decades after the arrival to United States. However, Juarez and Hjeron (2017) did not find a similar pattern for Sweden.

It has been also indicated that nulliparity is usually associated with a significantly increased risk of low birthweight; however, grand multiparity and great grand multiparity, are also associated with reduced birth weight (Shah, 2010). Non-lineal patterns have also been described for the impact of maternal age at birth. More specifically, several studies show a U-shaped relationship between maternal age and birthweight: the youngest (younger than 15) and the oldest (aged 40 and older) mothers are more exposed to lower birthweights (Saloojee and Coovadia, 2015; Goisis *et al.*, 2017).

The theoretical and empirical literature that has been discussed in this section is useful for understanding how the gradient in birthweight among different immigrant origins

depends on the specific composition of immigrant subpopulations. With this in mind, we expect the birthweight will vary according to the distribution of specific features within each immigrant origin.

Data, variables and analytical strategy

The data used in this study was generated by linking a sample of the micro-data from the 2011 Spanish Census with micro-data from the Municipal Register of Inhabitants of the years 2012 and 2016 and with birth and death records from the Vital Statistics (Movimiento Natural de la Población) for the period 2011-2015. Linking diverse sources of statistical data provided the unprecedented possibility of carrying out a joint analysis of several social and demographic factors that potentially may affect birth outcomes. For our analysis we extracted data regarding mothers who delivered a baby in the period 2011-2015 from this linked database.

Our dependent variable is singleton *Birthweight* at term (37-41 weeks gestation).

In our analysis we include several covariates:

Origin. This aggregated variable includes four main groups of countries of origin according to their development level and geographic location: EU-15, EU New Member States, Latin America and Africa.

Migratory status accounts for two variables: time of residence in Spain in years and maternal nationality (Spanish; other).

Maternal situation includes: *age at birth*, *family situation* (1. married, 2. in consensual union, 3. no couple) and parity (1, 2, 3 and 4+).

Socio-economic status. As a measure of *socio-economic status* (SES) we use maternal education (primary, secondary and tertiary). To complement SES, we include the highest occupational status in the household according to 2011 Spanish Census (this variable includes 5 categories of SES: (1) Upper (big employers, managers and higher-grade professionals); (2) Medium (small employers, lower-grade professionals, technicians); (3) Low (service workers, skilled, semi-skilled and unskilled manual workers); (4) Inactive; and (5) Unemployed.

In order to achieve our aims, we utilized two analytical approaches. In the first stage we ran Ordinary Least Squares regression models to estimate the effect of independent variables on birthweight.

Regression modelling implicitly assumes that the distribution of features is similar for all individuals in the sample. Therefore, if there are substantial differences in the composition of certain features, regression might be insufficient to capture their effect on the studied outcome. To overcome this limitation, in the second stage we applied a decomposition technique developed by Blinder (1973) and Oaxaca (1973). This regression-based decomposition technique allowed us to clarify the extent to which differences in birthweight between infants born by native and foreign mothers are due to disparities in the measured features. This technique allows these differences to be decomposed into explained and unexplained parts. The explained part of this gap is

the variance in outcomes attributable to group differences in potential contributing variables. In this study, therefore, the explained portion represents the amount by which native-foreign differences in birthweight would be reduced in the hypothetical case that a foreign mother had the same mean levels of measured characteristics as native mothers and both populations —natives and migrants— have the same composition. The second portion of the gap cannot be explained by differences in the distribution of categories in the population included in the model and may be due to the specific behaviour of different categories in the population.

Preliminary results

The descriptive results show substantial differences between the 4 categories of migrants (EU15[3], New Member States[4]; Africans and Latin Americans). Table 1 shows the distribution of specific features of the 4 immigrant categories included in the analysis. As expected, there are considerable variations in specific socio-demographic features among all four categories of origin. However, EU15 immigrants present the most differences from the other categories of immigrants. Mothers from the EU15 are on average older than their counterparts from other countries of origin. Regarding years since migration, almost 56% of EU15 mothers were residing in the host country for at least 11 years at the time of delivery. By contrast, among NMS migrants, those who had been residing in the host country for more than ten years accounted for less than 8%. We also observed that EU15 nationals have noticeably higher levels of educational attainment. These differences are especially notable among people with secondary and tertiary education. Tertiary education among EU15 mobile workers (53.6%) is almost 10 percentage points higher than among Spaniards and 45 percentage point higher than among Africans. EU15 mothers acquire Spanish nationality more frequently than mothers from any other origin. Meanwhile, African mothers stand out in terms of parity. For more than 11% of Africans the registered delivery was their fourth or more. African mothers live in formal relationships more often than any other migrant group.

[3] The EU15 comprised the following 15 countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom.

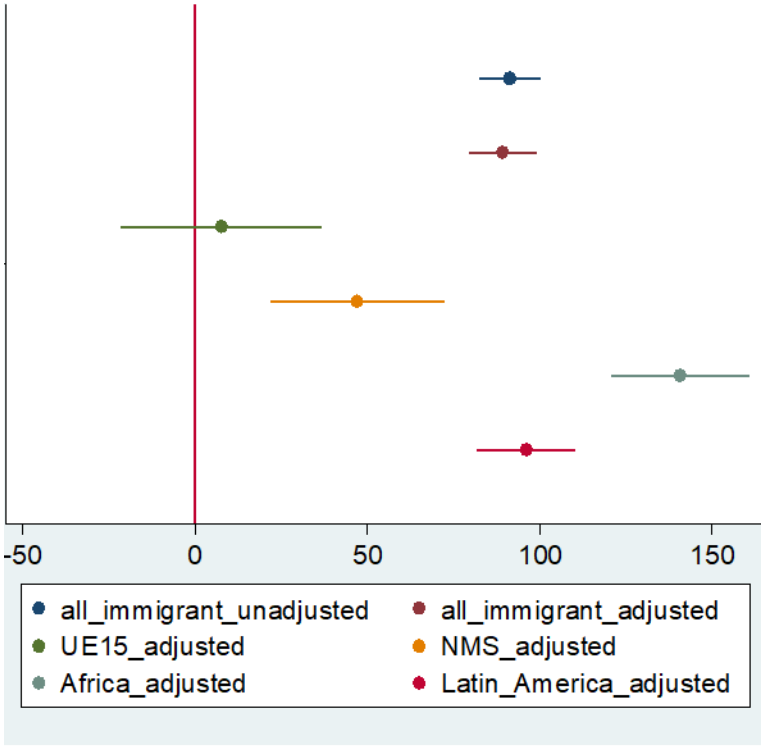
[4] New Member States are Bulgaria, Croatia, Cyprus, Czechia, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia

Table 1 Characteristics of the study population

		Born in Spain	All foreign born	EU15	NMS	Africa	Latin America
N		104,149	12,799	1,283	1,754	3,339	5,693
Birthweight	mean	3246.857	3301.568	3272.972	3297.131	3323.731	3303.601
Parity %	1st	54.103	44.94	49.61	51.97	30.44	47.99
	2nd	42.554	38	42.51	39.7	34.71	38
	3th	6.662	12.42	5.6	6.14	23.21	10.99
s	4th+	1.233	4.64	2.29	2.19	11.64	3.02
Mother's age %	>25	4.97	12.48	2.84	14.21	15.52	14.08
	25-34	52.65	54	44.01	65.75	56.14	51.1
	35+	42.37	33.53	53.15	20.04	28.34	34.82
Mother's education %	primary	5.57	19.07	4.58	11.79	50.45	11.03
	secondary	51.43	54.47	41.82	71.27	40.85	61.37
	tertiary	43	26.46	53.6	16.94	8.7	27.6
Couple status %	married	74.33	70.78	67.46	66.69	85.84	63.37
	union	17.22	16.93	21.39	21.53	3.63	22.25
	single	8.45	12.29	11.15	11.78	10.53	14.38
Houshold occupational status	high	41.25	21.43	48.18	8.5	7.01	22.47
	medium	29.51	25.53	28.98	24.73	17.61	26.49
	low	27.09	46.97	19.85	60.49	64.63	45.89
	inactive	2.04	5.35	2.98	5.82	8.66	4.66
	unemployed	0.11	0.72	0.1	0.46	2.08	0.49
Mother's nationality %	Spanish	99.81	17.92	44.24	1.85	6.27	20.46
Time in Spain	0-5 years		39.75	24.53	42.83	49.66	38.36
	06-10 years		35.19	19.48	49.41	30.62	38.72
	>10 years		25.06	55.99	7.76	19.72	22.92

Figure 1 shows OLS regression coefficients taking as a category of reference the mothers born in Spain. Globally, non-adjusted data and adjusted data both confirm the incidence of the *Healthy Immigrant Paradox* for immigrant population in Spain. Babies born to Spanish mothers have lower average weight when compared to any other category. However, it should also be noted that according to the regression model, the difference in weight between babies born to EU15 mothers and to Spanish mothers is not significant. The adjusted model clearly shows that Latin Americans and Africans give birth to heavier babies when compared to Spaniards and EU15 migrants. In other words, it has been observed that EU15 mothers differ in many ways from mothers of other origin groups. In order to separate the compositional effect from others that can potentially explain the differences, such as positive selection of non-EU15 migrants in terms of overall health, we performed an Oaxaca-Blinder decomposition.

Figure 1 OLS regression coefficients for singleton birthweight by origin



If not stated otherwise coefficients adjusted by: parity, new-born's sex, maternal age, maternal education, couple status, household's occupational status, year of birth

Table 2 shows the results of the Oaxaca-Blinder decomposition of differences between EU15 mothers and the three other categories of migrants. The upper panel reports adjusted birthweights for both groups and the difference between them. It also shows how much of this gap can be explained by differences in observable characteristics between the groups (explained portion) and how much remains unexplained. The lower panel of the table shows the contribution of each covariable included in our models to the part that stems from observable characteristics. Table 2 also reports the relative contribution of the differences in distribution of each characteristic included in our models to the total difference in birthweight.

When we compare EU15 and NMS mothers, the compositional differences account for 97% of the overall difference in birthweight. The most important factors that explain the differences between those two origins are disparities in time spent in Spain which accounts for 75% of the total difference. Another factor with a considerable impact on differences in new-born weight is disparity in maternal age and the household's occupational status which account respectively for 26% and 32% of the gap. Interestingly, differences in education reduce the gap between EU15 and NMS birth outcomes by 31%.

When the birth outcomes of EU15 and African mothers are compared, decomposition estimates show that disparities in the features included in our models account for 75% of the total differences. Differences among parity, maternal age and household account for almost half of the overall gap in birthweight. In turn, the comparison between EU15 and Latin American countries reveals that only 50% of the gap can explained by disparities in the composition of the features included in our analysis. Household occupational status and maternal age are the two factors that most contribute to the gap between those two groups.

Tab. 2 Oaxaca-Blinder decomposition of differences among immigrant mothers

	EU15 vs NMS		**EU15 vs Africa**		**EU15 vs Latin America**	
	Coef.	*Contribution to gap %*	*Coef.*	*Contribution to gap %*	*Coef.*	*Contribution to gap %*
EU15 born	3202.58		3202.58		3202.58	
Other	3249.82		3330.76		3297.74	
Difference	-47.24		-128.18		-95.16	
Explained portion	-45.97	97%	-96.14	75%	-47.69	50%
Unexplained portion	-1.27	3%	-32.04	25%	-47.47	50%
Explained portion - contributions from group differences in:						
Parity	1.19	-3%	-23.11	18%	-5.16	5%
Mother's age	-12.10	26%	-28.34	22%	-7.07	7%
Mother's education	14.81	-31%	-7.77	6%	-2.28	2%
Couple status	-0.65	1%	3.67	-3%	-0.79	1%
Houshold occupational status	-15.10	32%	-21.62	17%	-11.59	12%
Time in Spain	-35.62	75%	-11.64	9%	-4.76	5%
Mother's nationality	1.62	-3%	-7.34	6%	-16.04	17%

Conclusions

In line with previous research, our results provide strong population-based evidence for the healthy immigrant effect in birthweight in Spain. However, our research also shows that birth outcomes vary significantly depending on origins. When adjusted for several relevant covariates we observed no significant difference in birthweight between Spanish and EU15 mothers. Interestingly, on average immigrants from Africa and Latin America give birth to heavier children compared to native and EU15

mothers. This result is especially interesting given that the origin populations ofcountries included in both categories are reported to have lower birthweight on average when compared to European populations (UNICEF, 2004).

Finally, we observed that the gap in birthweight between the two European groups can almost be totally accounted for by compositional differences, especially time spent in Spain. This result suggests that the birthweight between EU15 and NMS is mainly explained by differential migration dynamics and socio-economic assimilation patterns. The greater contribution of unobserved features in the decomposition of differences between EU15 and African mothers and especially between EU15 and Latin American mothers suggests that the gap in birthweight cannot be explained by compositional characteristics alone. More specifically, our results imply that several unobserved characteristics (such as selectivity by maternal health) also play an important role in explaining differences in birthweight among immigrants to Spain. Nevertheless, it should be highlighted that our analysis showed that migration dynamics, patterns of integration and socio-demographic selectivity play an undeniable role in delivery outcomes among immigrants.

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