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# Intergenerational transmission of economic success in Austria with a focus on migration and gender

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## Abstract

In this paper, we analyse the intergenerational transmission of economic success in Austria using the European Union Statistics on Income and Living Conditions 2011 dataset (EU-SILC 2011). Starting point of the investigation is a two-step estimation procedure, where we detect a significant positive intergenerational association between the economic situation of the parental household and educational attainments as well as gross hourly wages of their male and female descendants independently. Furthermore, we shed some light on the intergenerational social mobility *black box* by explaining the direct effect of the income situation of the parental generation on attainable wages of the child generation within the transmission system. It turns out that this effect is significantly underestimated when applying ordinary least squares regressions only, where the perceived socioeconomic status is taken exogenous. Finally, we apply instrumental variable quantile regressions to demonstrate that the direct intergenerational economic association between parents and their descendants is strongest for top earners. Alongside this proceeding, we introduce an alternative way to think about the impact of a bundle of additional intergenerational transmission channels like cognitive ability, noncognitive personal traits, and aspects of physical appearance on an empirical level. Overall, the findings of the paper, where special attention is paid to migrants, offer a better understanding on the intergenerational transmission of economic success mechanism and to what extent this process influences income persistence between generations.

**Keywords:** Intergenerational social mobility, Gender, Migrants, Labour market, Instrumental variable quantile regression

**JEL Classification:** C36, J15, J16, J31, J62, J68

## 1 Introduction

The intergenerational transmission of economic success or the intergenerational social mobility is an intensely discussed topic in both economics and sociology. In general, intergenerational social mobility is understood as the capability of the next generation to achieve a higher socioeconomic status than the parental generation. If children of rich parents become rich adults and children of poor parents become poor adults, then this can be

attributed to rigid structures in a society, which results, among other things, from the intergenerational transmission of income status and educational attainment (Corak 2013). There is a strong link between the level of education and the economic situation of the parental generation and the educational outcomes as well as the attainable incomes of the child generation (Schneebaum et al. 2016; Altzinger and Schnetzer 2013; Causa and Johansson 2010; Franzini and Raitano 2009). On the one hand, the attainable incomes of the child generation are centrally determined by their own level of education, which is in turn the result of private and public investments. If there is a lack of private investment in

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education due to financial and social constraints of the parent's households, this can be compensated for by a corresponding supply of public education institutions. The educational achievements of the next generation are therefore directly influenced by the economic situations of the parental generation. On the other hand, a few studies indicate that there is also a direct impact of the financial situation of the parental household on their sons' and daughters' earned wages. Insights from behavioural psychology offer some plausible explanations (see e.g. Mayer 2002), albeit only partial ones. According to one of them, the 'good parent' theory, causes low family income stress for parents and thereby reducing their attitude to help children's growth, which in turn adversely affects their cognitive and noncognitive development. However, cultural and institutional aspects also play a crucial role for the intergenerational transmission of economic success, as well as the genetic predisposition (Bowles and Gintis 2002). From an empirical point of view, it is still very complex to get a more profound understanding of the processes that run behind the intergenerational transmission of economic success, because of the interdependencies between family economic conditions and other background factors like parents' educational achievements, ability, motivation, behaviour, as well as environmental factors. Up to now, related studies—with a few exceptions (see e.g. Gregg et al. 2019, Causa and Johansson 2010 or Franzini and Raitano 2009)—have not addressed these interdependencies, so that the transmission of economic success across generations still remains something of a *black box* (Bowles and Gintis 2002).

With this paper, we try to shed some light on the intergenerational social mobility black box by applying a two-step estimation procedure (according to Franzini and Raitano 2009), where we explore—for the Austrian case—the intergenerational association between the economic situation of the parental household and educational attainments as well as gross hourly wages of their male and female descendants independently. Thereupon, we endogenize the direct effect of the income situation of the parental generation on hourly earnings of the child generation and investigate how this effect varies across their wage distributions. This proceeding shows us an alternative way of thinking about the impact of additional transmission channels on an empirical level. Those channels are a bundle of factors, which consists, *inter alia*, of cognitive ability, noncognitive personal traits, and aspects of physical appearance. A growing literature already highlights the relative importance of these determinants that are not generally considered to be factors of production (see e.g. Blanden et al. 2007 or Bowles and Gintis 2002). While income immobility is a constraint

faced by all (Altzinger and Schnetzer 2013), it can affect some population groups more severely. Therefore, we pay special attention to migrants and beyond that, focus on gender differences within the intergenerational transmission of economic success process.

In summary, this paper attempts to identify the existence of an economic association between generations in Austria and proposes a new methodological perspective that addresses the following essential issues for estimations of intergenerational social mobility: the direct impact of the endogenous socioeconomic status of the parental household on attainable earnings of their male and female descendants and how this effect varies across their conditional wage distributions.

From a social and economic policy point of view, it is worthwhile to strive for a high level of social mobility between generations in order to compensate for socioeconomic disadvantages and to ensure equality of opportunity. If earnings of the next generation are strongly dependent on the income situation of the parental generation, means, that children of poor parents stay poor. This imply that children from destitute families are denied access to well-paid jobs. An efficient allocation of existing resources or rather an efficient utilization of reserves of talent will not take place, since children with high potential are in all stages of an economy's income distribution.

The remainder of this paper proceeds as follows: Sect. 2 provides a brief literature overview. Section 3 introduces the data set used and presents some descriptive statistics. Section 4 describes the econometric strategy and Sect. 5 presents the results of our estimation procedure. Finally, Sect. 6 concludes and gives some policy suggestions.

## 2 Literature at a glance

Intergenerational social mobility has been the focus of numerous studies of both sociologists and economists in the past decades and can be investigated by income, education, occupation or social class (Causa and Johansson 2010). Economists typically try to measure how income or wage status is transmitted across generations (Nybom and Stuhler 2017; Black and Devereux 2011; Solon 1999), while sociologists analyse mobility across social classes (Breen 2004; Erikson and Goldthorpe 1992) or occupational status (Jonsson et al. 2009; Blau and Duncan 1967). In addition, a broad body of literature focuses on the intergenerational transmission of education (see Hertz et al. 2007 for international evidence, and Schneebaum et al. 2016 for evidence from Austria).

Studies on intergenerational social mobility have recently gained more recognition. Contributions have been provided by Chetty et al. (2014, 2017) for the United States, and by the OECD (2010, 2018), Raitano and Vona

(2015), and Franzini and Raitano (2009) for European OECD countries.

A family's background and financial situation can influence their offspring's future income and wealth through various intergenerational transmission channels. Particularly, through investing in their offspring's education, parents can and do influence their children's later economic success (Causa and Johansson 2010). Becker and Tomes (1979, 1986) introduced the standard economic model for the analysis of intergenerational income mobility and most empirical studies are in some way based on their model. Assuming utility maximizing households, their theory states that the future earnings of the offspring depend on their parents' investments in formal education, market luck and the endowments inherited from their family. These endowments can either be genetically determined, like race and ability, or determined by the family environment, like family reputation, connections, knowledge and skills. Especially in the presence of borrowing constraints and budget restrictions, poorer families sub-optimally invest in their children's education, leading to an advantage for children of wealthier families (Grawe and Mulligan 2002; Becker and Tomes 1986). Solon (2004) uses a modified version of the Becker–Tomes model to analyse why intergenerational income mobility varies across countries and over time. He concludes that intergenerational income persistence increases the greater the extent of heritability of income-related traits, the more efficient the investments in children's human capital, and the higher the earnings return to human capital, while persistence decreases with the progressivity of public investment in children's education. Furthermore, the model of Solon (2004) establishes a link between intergenerational income mobility and cross-sectional income inequality, as he shows that a society with greater income inequalities might have greater inequalities in the investments in children's education. Several recent studies find that countries with more cross-sectional income inequality tend to be associated with less intergenerational mobility (Blanden 2019; Corak 2013; Causa and Johansson 2010; Björklund and Jäntti 1997). This relationship is often referred to as '*The Great Gatsby Curve*'.

In addition to investments in children's human capital, many other intergenerational transmission channels have been discussed in the literature like individual behaviour, relational capital and social networks (Franzini and Raitano 2009). Moreover, directly and indirectly inheritable traits like intelligence, motivation, values and preferences (Black and Devereux 2011) as well as cognitive and non-cognitive skills ("soft skills") (Bowles and Gintis 2002), and living in certain neighborhoods (Chetty and Hendren 2018) contribute to the intergenerational

transmission of economic success. Over the past 10 years, a few studies have focused on the wider role of cognitive and non-cognitive skills along with education in the intergenerational social mobility process, finding that the dominant transmission channel is educational attainment, leaving a smaller role for 'skills' accounting for income persistence between generations (Björklund et al. 2017; Blanden et al. 2007).

The standard approach for measuring intergenerational social mobility used by economic researchers is to estimate the intergenerational income elasticity by regressing a logarithmic measure of children's income on a logarithmic measure of parent's income (typically by applying ordinary least squares), thereby measuring the extent to which descendant's income levels reflect those of their parents (Black and Devereux 2011; Causa and Johansson 2010; Solon 2002). Another frequently used measure is the partial correlation between parents and descendant incomes, which adjusts for any changes in variance that occur between the parental and the child generation (Blanden 2013; Black and Devereux 2011).

Studies focusing on cross-country differences in intergenerational mobility show substantial earnings persistence across generations in all countries and typically report lower levels of income persistence for Scandinavian societies, while the estimated intergenerational persistence tends to be higher in the United States and the United Kingdom (see e.g. Corak 2013; Jäntti et al. 2006; Solon 2002). Jäntti et al. (2006) point out that most of cross-country differences in income correlations and elasticities stem from rather limited parts of the bivariate earnings distribution, indicating that persistence is most pronounced in the tails of the distribution. The number of studies focusing on the intergenerational transmission of economic resources across the wage distribution, where we also make our contribution, is rather small. By applying latest quantile regression techniques, recent Studies for the UK, the USA, and Germany show higher intergenerational persistence at the top of the earnings distribution compared to the middle (Gregg et al. 2019; Palomino et al. 2018; Schnitzlein 2016). Our findings are in line with these studies that the direct intergenerational economic association between parents and their descendants is strongest for top earners.

There are not many studies on intergenerational social mobility in Austria yet. Due to deficient data and the complexity of this topic, the existing literature focuses on either income or education as essential parameters for the persistency of (dis)advantages over generations. Statistik Austria (2007) was first to examine an approximation of social mobility in Austria by using the European Statistics on Income and Living Conditions 2005 dataset (EU-SILC 2005) that includes an ad-hoc-module

on intergenerational transmission of poverty. They find a positive relationship between the financial situation and education of the child generation and the education and income performance of their parents. However, the authors stress that this does not necessarily define a causal relationship, as many other factors, especially regarding the income, play an important role.

Altzinger and Schnetzer (2013) analyse the intergenerational mobility of income in Austria compared to other member states of the European Union. They conclude that the wages of the child generation are crucially dependent on the financial situation of their parents. In addition, they describe substantial differences in the magnitude of mobility of income between the considered countries. According to Altzinger and Schnetzer (2013), Austria pertains to a group of welfare states that are characterized by a low mobility of income, as compared to Northern European countries.

When considering the mobility of education, gender aspects appear to play an essential role (Fessler and Schneebaum 2012). The education career of the father influences the child's education more than the mother's education. Schneebaum et al. (2016) expand this analysis by further examining the migration background. Using data of the EU-SILC 2011, they show that the educational levels of girls and migrants are to a greater extent dependent on their parents' educational level compared to the educational levels of boys and natives.

All the calculated intergenerational income and education elasticities in the studies described above support the idea that the income situation of the parental household matters for the later economic success of their descendants. However, providing empirically insights in the causal relationships and mechanisms still remains a highly complex endeavor, because of the interdependencies between family income and other background factors, which affects both sides of the relation. It is therefore not possible to derive clear social and economic policy implications (Solon 2004). Although we are aware of the fact that uncovering causal mechanisms is not realizable for several reasons, we nevertheless attempt to consider, in contrast to the existing literature, the endogenous nature of the income situation of the parental household, at least for the direct impact on hourly wages of descendants. For this purpose, we expand the standard approaches of measuring intergenerational social mobility discussed above and present a new methodological perspective, where we explain the socioeconomic status of the parental household within the transmission mechanism system rather than taking it as exogenous. Furthermore, we examine how the effect of the endogenous modelled economic situation of the parental generation varies across the conditional wage distribution of their

descendants and therewith introduce an alternative way to think about the impact of a bundle of additional intergenerational transmission channels which consists, *inter alia*, of cognitive ability, noncognitive personal traits and aspects of physical appearance, on an empirical level.

### 3 Data

#### 3.1 Data description

To measure the intergenerational transmission of economic success, incomes of two interconnected generations during two different time periods must be investigated. However, this leads us to a recurring problem of data availability. Surveys, which includes lifetime earnings of two interconnected generations are only available in a few countries [see e.g. Gregg et al. 2019, who uses the British Cohort Study (BCS)]. Furthermore, for Austria, there is no data available on earnings of the parental generation, which makes it rather intricate to conduct a sensible two-sample, two-stage least squares (TS2SLS) estimation following the work of Björklund and Jäntti (1997).<sup>1</sup> Investigating on the intergenerational transmission of economic success in Austria is therefore only possible by using data that contains questions concerning the income of the respondent and the former financial situation of his/her parents. Such survey data is offered by the European Statistics on Income and Living conditions (EU-SILC) in its 2011 questionnaire that includes an ad-hoc-module on intergenerational mobility of disadvantages. However, by using survey data, there is an ongoing problem regarding retrospective questioning. Sometimes participants do not declare their real incomes and there is a tendency to over- and understatements, especially at both ends of the income distribution.

The EU-SILC survey is conducted in private households with at least one household member aged at least 16 and focuses on income, employment, living, and health situations. The EU-SILC project started with a regulation of the European Parliament in 2003 to obtain comparable data of living conditions and incomes of the population for all countries of the European Union and serves as the basis for statistics on income distribution, poverty, and social integration. For our purpose, it is sufficient to draw upon data for Austria only, also because of the fact that there are large differences with respect to labour market institutions between European Union countries.

#### 3.2 Sample selection and descriptive statistics

We include respondents aged between 25 and 59, as only for this sub-group the ad-hoc-module on

<sup>1</sup> For a general description of the TS2SLS approach, see OECD (2018), which has already undertaken first attempts to apply it to Austria.

**Table 1 Descriptive statistics: gross hourly wages by gender and migration background. Source: EU-SILC 2011, Author's calculations**

	Observations	Mean age	Gross hourly wage		
			Mean	(SD)	Median
Females	1949	42.59	13.70	(6.39)	12.12
Natives	1644	42.86	14.10	(6.44)	12.66
MB 2nd Gen	34	41.59	15.37	(8.44)	12.18
MB 1st Gen (other EU Member State)	113	42.02	12.64	(6.35)	11.04
MB 1st Gen (non-EU Country)	158	42.01	9.86	(3.63)	8.65
Males	2081	42.62	17.03	(8.86)	14.79
Natives	1758	42.72	17.69	(9.05)	15.58
MB 2nd Gen	33	40.14	16.25	(7.26)	18.12
MB 1st Gen (other EU Member State)	82	42.63	17.67	(11.81)	14.04
MB 1st Gen (non-EU Country)	208	41.05	11.58	(4.44)	10.38
Total	4030	42.32	14.89	(7.75)	12.98

intergenerational transmission of disadvantages is included in the EU-SILC 2011 dataset. Individuals that are still in education were excluded, as well as self-employed individuals due to difficulties concerning the measurement of their incomes, as emphasized by Causa et al. (2009). Moreover, some respondents gave no information about the parental income status and so we end up with a sample of 4030 individuals (1949 female and 2081 male respondents).

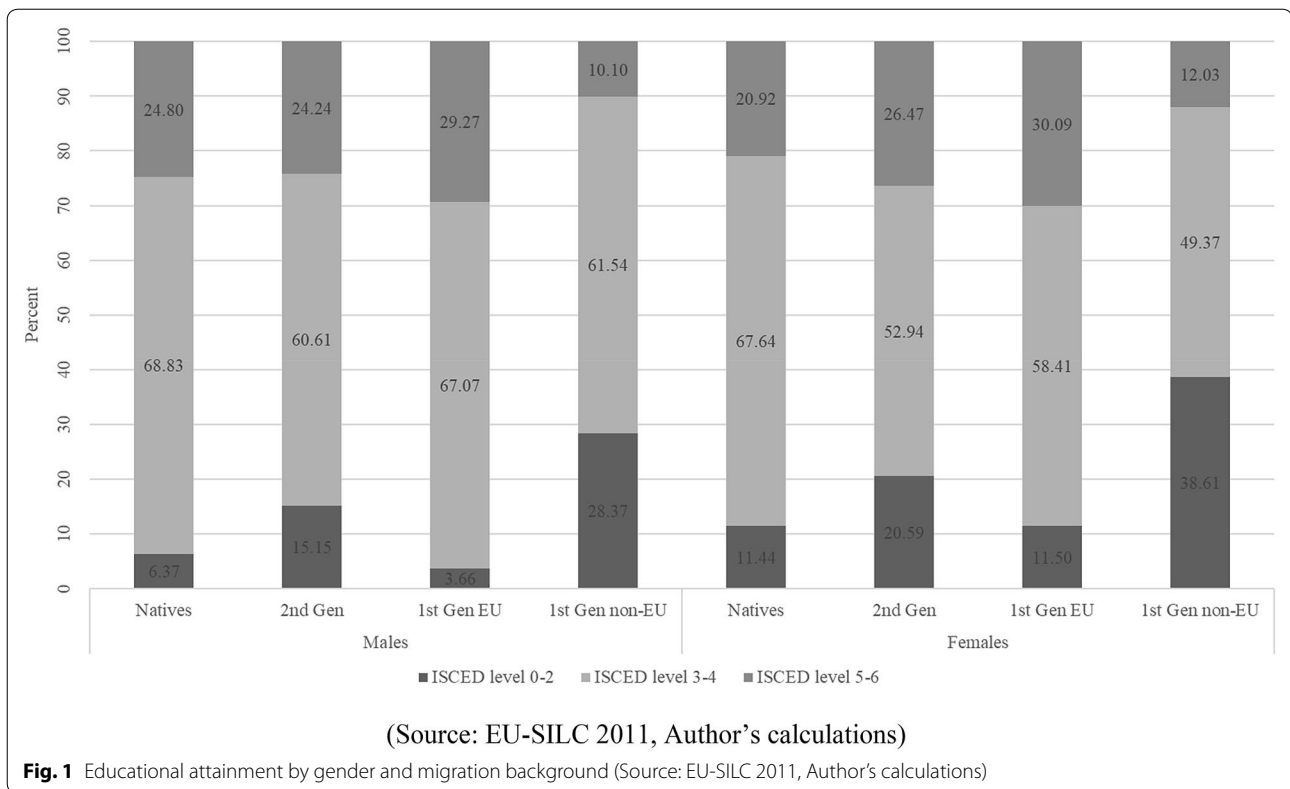
The EU-SILC data provides detailed information regarding the respondents' migration background. Following the United Nations Economic Commission for Europe (UNECE 2015) definition, a person is considered to have a migration background if both parents were born abroad. Conditional on the children's place of birth, this group can be further divided into first- and second-generation immigrants. Regarding the first-generation migrants in our sample—individuals who were born abroad and immigrated themselves—we further distinguish between immigrants from other EU-27 countries and non-EU countries.

For the presented income variables, the year 2010 constitutes the base period and the income level of the parental generation is examined by two retrospective questions that were asked within the survey. Individual incomes are measured by gross hourly wages for employees in our analysis, which we derive from the reported monthly incomes and hours usually worked per week. Furthermore, we exclude all those observations with hourly wages below € 5. Table 1 provides descriptive statistics for gross hourly wages by gender and migration background of the respondents. The mean gross hourly wage observed in our sample is € 14.89, with male respondents earning on average € 17.03 per hour, while

the mean income of women is found to be € 13.70 per hour. Table 1 also unveils that for both genders, the mean hourly wage is lowest for first generation immigrants from non-EU countries.

We further utilize information on the highest educational level attained by the respondents for our investigation. The educational classification that is used in EU-SILC 2011 is the International Standard Classification of Education (ISCED 1997) coded according to the seven ISCED-97 categories. We aggregate the given answers into three education categories that can be ranked: (1) lower secondary at most (compulsory school), which captures ISCED-97 levels 0 to 2, (2) a graduation in secondary school, which is a synonym for ISCED-levels 3 and 4, and (3) a tertiary degree, representing ISCED-levels 5 and 6. Figure 1 illustrates the distribution of educational attainment by gender and migration background. Women, both natives and those with a migration background, are on average less educated than their male counterparts. Furthermore, almost 40% of first-generation females and more than 28% of first-generation males with non-EU origin have no more than lower secondary education.

As explained in detail in Sect. 4.1, the socioeconomic situation of the parental household of each respondent is derived from two questions included in the EU-SILC 2011 dataset, namely, the financial situation of the parental household and the ability of parents to make ends meet. These questions provide information regarding the economic situation of the parental household when the respondent was 14 years old and are categorical, ranging from 1 to 6 (from “very bad” to “very good” for the financial situation and from “with great difficulty” to “very easily” for the ability to make ends meet). Figures 2



and 3 shows the distribution of these two items by migration background of the respondents. More than 27% of first-generation non-EU immigrants in the sample report that the financial situation of the parental household was either very bad or bad, and more than 33% of this subgroup report great difficulties making ends meet. However, more than 34% of this group state that the financial situation was good or very good, showing that the reported financial situation of the parental household is more widely dispersed for non-EU immigrants than for natives.

#### 4 Methods

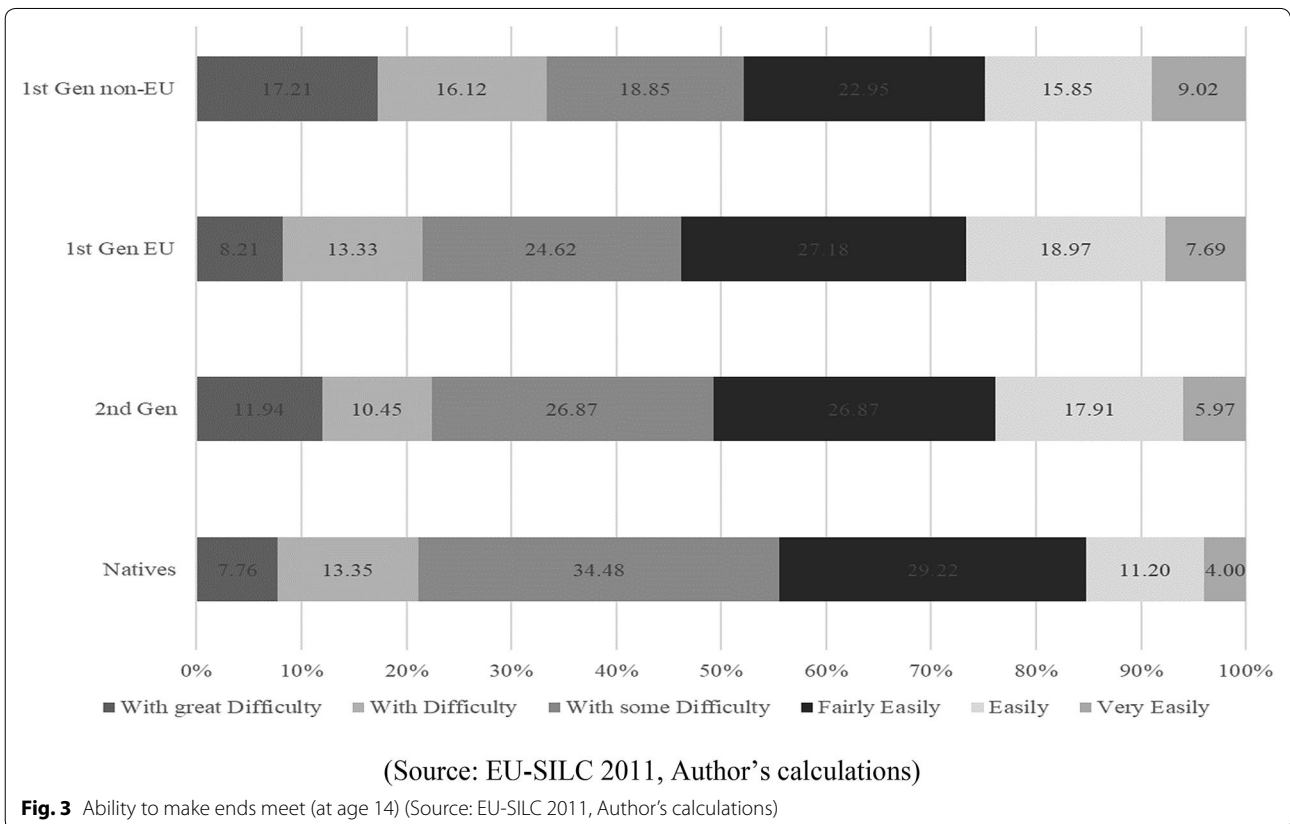
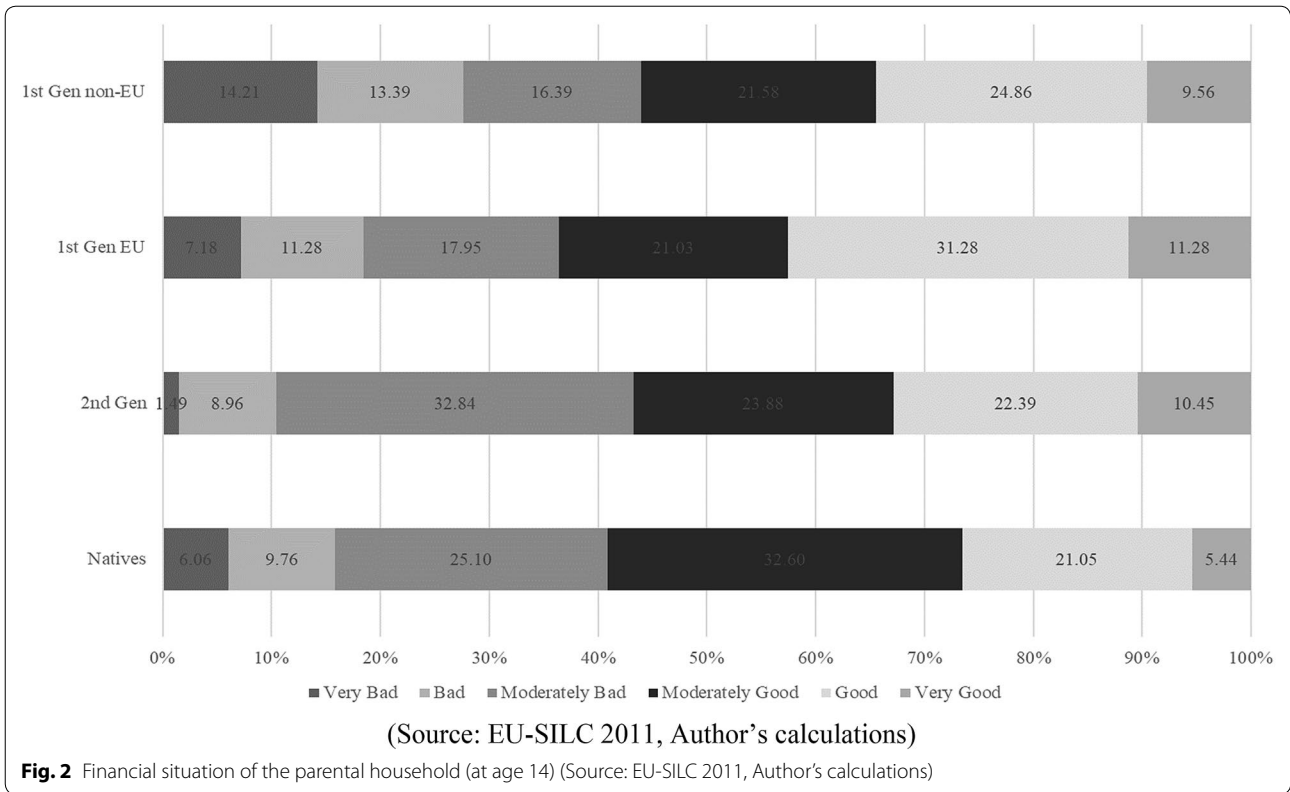
In this section, we first introduce an index to measure the economic situation of the parental generation. Thereafter, we describe the equations to be estimated and the econometric methods applied, i.e., ordered logit model, mean regression, instrumental variable regression, and instrumental variable quantile regression (IVQR). Given that IVQR is not as common as ordinary least squares (OLS) and two-stage least squares (TSLS), we provide a short explanation of this method following Lee (2007) and Andini (2010). Furthermore, we briefly discuss the instrument we use for our instrumental variable approach of the direct link between the socioeconomic

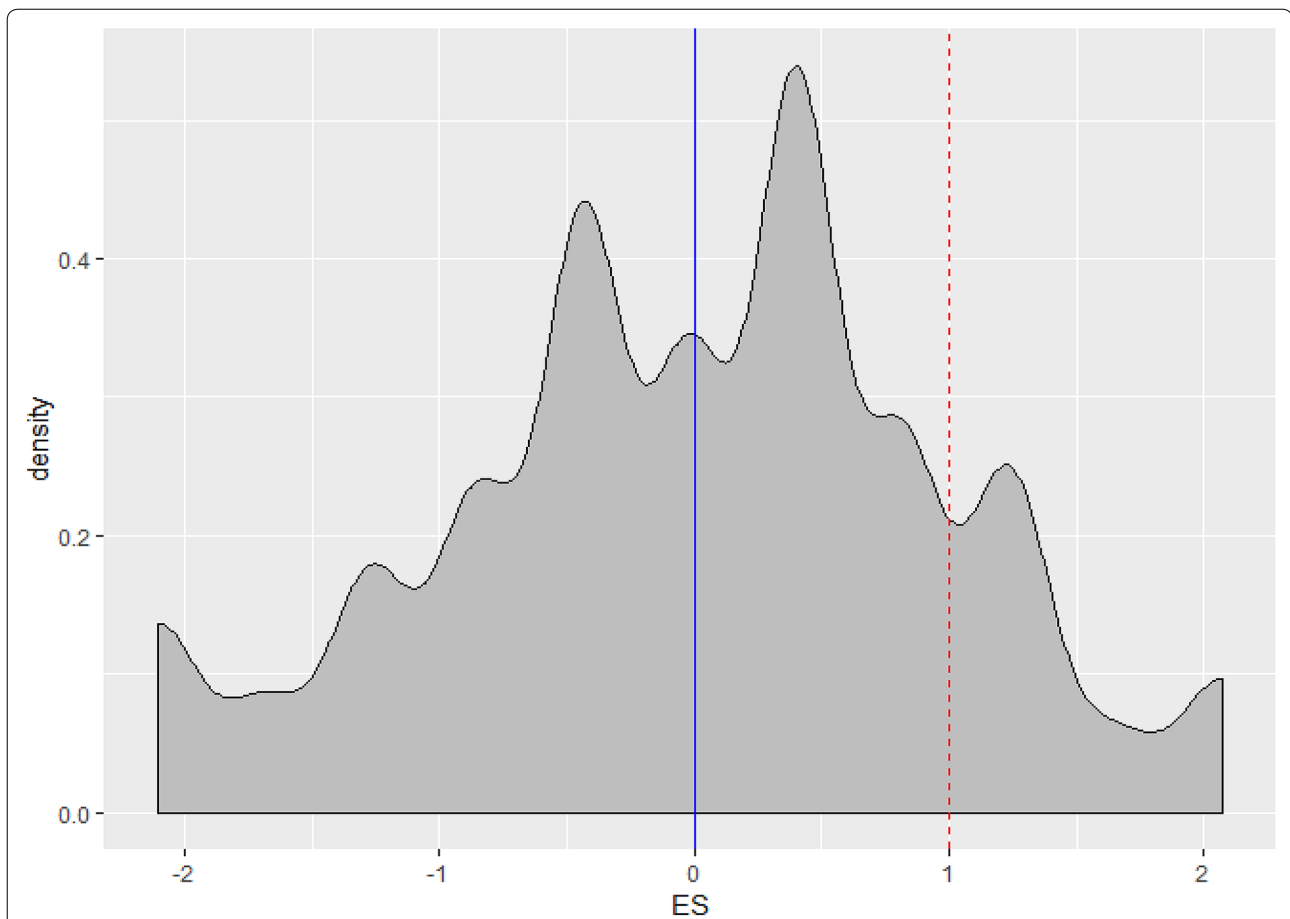
status of the parental generation and attainable wages of the next generation.

#### 4.1 Socioeconomic status index

We measure the income status of the parental household for each individual by calculating a composite index, which is derived based on answers to two questions from the EU-SILC (for a graphic depiction see Fig. 2 and 3 in Sect. 3.2). The first question assesses the respondent's perception about the financial situation of the household in which the respondent was living when he/she was around 14 years old. The answers are scaled from 1 to 6, with 1 'very bad' and 6 'very good'. The second question assesses the respondent's perception about the level of difficulty experienced by the household in which the respondent was living when he/she was around 14 years old in making ends meet. The answers are scaled from 1 to 6, with 1 'with great difficulty' and 6 'very easily'.

We obtain the composite socioeconomic status index (our ES index) by applying a principal component analysis (PCA). With PCA, we are able to create one index variable out of the two basic variables ('financial situation of the parental household'; 'ability to make ends meet'). We extract the first principal component out of the principal component analysis and use it as our socioeconomic status index for further econometric





(Source: EU-SILC 2011, Author's calculations)

**Fig. 4** Distribution of the socioeconomic status index (Source: EU-SILC 2011, Author's calculations)

analysis. By doing so, we capture as much information in the original variables as possible, based on the correlations among those variables. The results of the principal component analysis show that our index roughly explains 90% of the total variance of the two basic variables. To facilitate the interpretation of the regression results, the index has been standardised with a mean equal to zero and a standard deviation equal to 1. So, if the index increases by one index unit (a rise in the index by the standard deviation), the income situation of the parental household is perceived to be better compared to the mean (as shown in Fig. 4, whereby the solid line denotes the mean and the dashed line denotes an increase in the index by the standard deviation), if the index decreases by one index unit, the income situation of the parental household is perceived to be worse compared to the mean. In a nutshell, an index value to the right of the mean denotes a perceived improvement in the socioeconomic situation of the parental

household and an index value to the left of the mean denotes a perceived deterioration in the socioeconomic situation. An example of a similar proceeding can be found in Sevilla-Sanz (2010).

#### 4.2 General approach

In order to assess the intergenerational transmission of economic success in Austria, we use as a first step, by following Franzini and Raitano (2009), an ordered logit model to investigate the effect of the socioeconomic status of the parental generation on the probability that the child generation achieve a certain level of education. The ordered logit regression estimated here, can be presented as follows:

$$e_i = \beta_X X_i' + \beta_{es} es_i + \varepsilon_i. \quad (1)$$



In Eq. (1),  $e_i$  denotes an ordinal dependent variable with three categories (ISCED 0–2, ISCED 3–4, ISCED 5–6), reflecting the highest educational attainment achieved by each respondent  $i$  (for details regarding the applied aggregation technique see Sect. 3.2). The matrix of covariates,  $X_i'$ , contains family background characteristics influencing the educational outcomes. One of the most important covariates in  $X_i'$  are fathers' and mothers' educational attainments, which are coded in the same way as those of the descendants. Following Fessler and Schneebaum (2012), both parents' education levels are included in the model to control for assortative mating. Furthermore,  $X_i'$  contains a migration background categorical variable, for which we differentiate between the first and the second generation as well as whether the respondents are born in an EU-27 country or outside the European Union. In addition, through  $X_i'$ , we control for the number of siblings in the parental household, whether the descendant lived with both parents when young, and the age of the respondents. Finally, the vector  $es_i$  denotes the socioeconomic status index, our main variable of interest and  $\varepsilon_i$  the logistically distributed random error.

As a second step, we estimate a simple OLS-regression to analyse to what extent the economic situation of the parental household affects the wages of the descendants, on top of the effect on educational attainments. To this aim, we follow traditional approaches (see e.g. Altzinger and Schnetzer 2013; Fields and Ok 1996; Zimmerman 1992) and estimate the following Mincer-like equation:

$$\ln(w_i) = \beta_0 + \beta_{X'} X_i' + \beta_{es} es_i + \varepsilon_i. \quad (2)$$

The dependent variable is now the gross hourly wage of each respondent  $i$ , represented by  $w_i$  in Eq. (2). In (2), the matrix of covariates,  $X_i'$ , now includes individual characteristics affecting hourly wages of the descendants. One important control variable in  $X_i'$  is a measure of labour market experience. It covers the actual number of years that the respondents spent in paid work. We also add a quadratic term of this labour market experience measure, since we assume that a potentially positive effect of experience on wages diminishes as the number of years spent in paid work increases. In addition,  $X_i'$  contains a dummy that indicates whether the individual is in a consensual union with or without a legal basis and a migration background categorical variable, identical to that in model (1). Furthermore, the categorical variable for the highest level of educational attainment of the descendants, which serves as dependent variable in Eq. (1), is now included in (2) as an independent covariate. Again, the vector  $es_i$  denotes our socioeconomic status index, and  $\varepsilon_i$  the error term.

In addition, we expand Eq. (2) by interacting our explanatory variables with a migration dummy<sup>2</sup> in order to get a deeper understanding regarding possible differences between natives and migrants within the intergenerational transmission of economic success process. Furthermore, all equations presented here are estimated separately for male and female descendants to investigate whether the influence of the socioeconomic status of the parental generation on educational achievements and earnings of the child generation are more strongly manifested for one particular gender. However, this is not solely done for that reason, but also to account for a selection bias in the usual way (see Heckman 1979).

### 4.3 Instrumental variable approach

Since it can be reasonably assumed that the socioeconomic status of the parental household is endogenous, we proceed by applying a two-stage least squares (TSLS) estimation following Griffiths et al. (2011). We suspect that the socioeconomic status of the parental household ( $es_i$ ) is determined within the system because intergenerational transmission channels like cognitive and non-cognitive skills as well as aspects of physical appearance, which are inherited biologically and also transmitted via social learning processes, influences both the economic situation of the parental generation as well as the educational achievements and the earnings of the next generation. The endogenous nature of  $es_i$  implies that the estimates of our general approach (Eqs. 1, 2) are biased and inconsistent, since the error term will be correlated with  $es_i$ .

To overcome this problem, we first need an instrument for  $es_i$ . More specifically, we require a variable that does not belong to the hourly wage or the educational achievement of each descendant and which is correlated with our socioeconomic status index  $es_i$ . In turn, the variable should be uncorrelated with the omitted factors in the error terms of Eqs. (1) and (2). Such a variable is very difficult to obtain, at least for the estimates of the direct link between the economic situation of parents and the educational outcomes of their children. Therefore, within our instrumental variable approach, we focus only on the impact on attainable wages of descendants, which still need to be seen as an effect on top of the influence on children's educational outcomes. Although, we also have to bear in mind that the estimation results of Eq. (1) are very likely (downward) biased and inconsistent because of the interdependencies between the socioeconomic

<sup>2</sup> This dummy variable takes the value one if both parents of the respondents were not born in Austria.

status of the parental generation and their educational attainments.

For our instrumental variable wage equation investigation, we use the number of children (below 18 years old) in the parental household of the respondents, when he/she was around 14 years old, as an instrument. Typically, a growing family size is associated with reduced economic possibilities for the family, and the number of siblings in the parental household does itself not directly belong to actual earnings of the respondents. The remaining question is, whether the error term of Eq. (2), which includes, *inter alia*, a person's cognitive and noncognitive skills as well as his/her physical appearance, is correlated with our instrument? Regrettably, we cannot rule out the possibility that household composition is correlated with 'ability': more siblings mean, on average, less parental attention, which in turn results in lower ability. Therefore, it is reasonable to assume that our used instrument does not meet all requirements for an adequate instrumental variable and thus the results of the IV approach are possibly also biased. However, we test for weak instruments and whether our IV approach is more efficient than the OLS estimation (Wu–Hausman test). The tests demonstrate that the utilized instrument is sufficiently strong and that our IV approach is more efficient than the OLS estimation (for details see Table 3 in Sect. 5.2).

Before implementing TSLS estimations, we require least squares estimates of the endogenous variable  $es_i$ . Therefore, we put in the first stage regression of our TSLS estimation the endogenous variable  $es_i$  on the left-hand side and all explanatory variables and the instrument on the right-hand side. The first stage regression is:

$$es_i = \gamma_0 + \gamma_{X'} X_i' + \delta_z z_i + \vartheta_i \quad (3)$$

whereby  $X_i'$  constitutes the matrix of covariates from Eq. (2),  $z_i$  denotes a vector of the above introduced instrumental variable and  $\vartheta_i$  the error term. By estimating the first stage regression by least squares, we can compute the fitted values  $\widehat{es}_i$ . The second stage regression is based on the original specification (2) with  $\widehat{es}_i$  replacing  $es_i$ :

$$\ln(w_i) = \beta_0 + \beta_{X'} X_i' + \beta_{\widehat{es}} \widehat{es}_i + \varepsilon_i. \quad (4)$$

As we are interested in assessing how the effect of the socioeconomic status of the parental generation varies across the conditional wage distribution of the child generation, we apply an instrumental variable technique for quantile regressions (i.e. the control-function estimator introduced by Lee 2007). Most applied research concentrates on averages and such a focus only partly depicts the complexities associated with producing credible findings. Many variables, such as earnings, have continuous distributions that can vary in response to treatments in ways

that averages cannot fully disclose. The instrumental variable quantile regression is a powerful tool to model distributional effects, even if the underlying mechanisms are multidimensional and complex (Balestra and Backes-Gellner 2017).

Similar to the instrumental variable technique introduced above, the control-function approach by Lee (2007) utilises a two-stage estimation. The first stage consists of an OLS-regression with (in our case) the endogenous variable  $es_i$  on the left-hand side and the matrix  $X_i'$  as well as our instrumental variable vector  $z_i$  on the right-hand side. The difference between the 'standard' instrumental variable procedure explained above and the approach by Lee is related to the second stage. While within the 'standard method', the actual values of  $es_i$  in the second stage are replaced by the predicted values  $\widehat{es}_i$  from the first stage, Lee adds the first stage residuals to the second stage, which are formed by actual values of  $es_i$  and  $X_i'$  (Andini 2010). The estimation procedure of our last step looks as follows:

$$\ln(w_i) = \beta_o^\theta + \beta_{X'}^\theta X_i' + \beta_{es}^\theta es_i + \beta_\vartheta^\theta \widehat{\vartheta}_i + \varepsilon_i^\theta \quad (5)$$

$$es_i = \gamma_0 + \gamma_{X'} X_i' + \delta_z z_i + \vartheta_i \quad (6)$$

$$\widehat{es}_i = E(es_i | X_i', z_i) \quad (7)$$

$$\widehat{\vartheta}_i = es_i - \widehat{es}_i \quad (8)$$

with

$$Quant^\theta(\varepsilon_i^\theta | X_i', es_i, \widehat{\vartheta}_i) = 0 \text{ for each } \theta. \quad (8)$$

As in the general model introduced in Sect. 4.1,  $i$  refers to the  $i$ -th individual in the sample and  $\ln(w_i)$  denotes the logarithm of the gross hourly wage. The matrix of covariates  $X_i'$ , the socioeconomic status index  $es_i$  and the instrument  $z_i$  are exactly the same variables that we use in Eqs. (2) and (3). The indicator  $\theta$  reports the quantiles 10, 25, the median, 75 and 90 of the gross hourly wage distributions.

## 5 Results

### 5.1 Estimates of the general approach

In this section, we present the regression results of our general approach, where we focus on the effects of the socioeconomic status of the parental household on their descendants' educational attainment and on their incomes earned in the labour market independently. Furthermore, we look in detail to what extent the

**Table 2 Returns on educational attainments separated by gender; ordered logistic regressions (average marginal effects). Source: EU-SILC 2011, Authors' calculations**

Dependent variable	Education level 1 (ISCED 0–2)		Education level 2 (ISCED 3–4)		Education level 3 (ISCED 5–6)	
	Male sample	Female sample	Male sample	Female sample	Male sample	Female sample
<i>ES</i>	–0.015*** (0.000)	–0.008*** (0.000)	–0.026*** (0.000)	–0.004*** (0.000)	0.042*** (0.000)	0.012*** (0.000)
Educational attainment father (level 2)	–0.024*** (0.000)	–0.064*** (0.000)	–0.042*** (0.001)	–0.031*** (0.000)	0.065*** (0.001)	0.096*** (0.001)
Educational attainment father (level 3)	–0.047*** (0.000)	–0.093*** (0.000)	–0.159*** (0.001)	–0.167*** (0.001)	0.206*** (0.002)	0.260*** (0.002)
Educational attainment mother (level 2)	–0.034*** (0.000)	–0.088*** (0.000)	–0.069*** (0.001)	–0.064*** (0.001)	0.102*** (0.001)	0.151*** (0.001)
Educational attainment mother (level 3)	–0.053*** (0.000)	–0.097*** (0.000)	–0.272*** (0.002)	–0.318*** (0.002)	0.325*** (0.002)	0.416*** (0.003)
MB 2nd Gen	–0.005*** (0.001)	0.083*** (0.002)	–0.010*** (0.002)	–0.008*** (0.001)	0.015*** (0.003)	–0.075*** (0.001)
MB 1st Gen (other EU Member State)	–0.001* (0.001)	0.021*** (0.001)	–0.002* (0.001)	0.006*** (0.000)	0.003* (0.002)	–0.027*** (0.001)
MB 1st Gen (non-EU Country)	0.099*** (0.001)	0.147*** (0.001)	0.037*** (0.000)	–0.037*** (0.001)	–0.136*** (0.001)	–0.110*** (0.001)
Age	–0.001*** (0.000)	0.000*** (0.000)	–0.002*** (0.000)	0.000*** (0.000)	0.004*** (0.000)	0.000*** (0.000)
No. of siblings in parental household	–0.001*** (0.000)	0.010*** (0.000)	–0.002*** (0.000)	0.005*** (0.000)	0.003*** (0.000)	–0.015*** (0.000)
Living with both parents	–0.007*** (0.000)	–0.055*** (0.001)	–0.012*** (0.001)	–0.006*** (0.000)	0.019*** (0.001)	0.061*** (0.001)

*Italic denotes main variable of interest*

Average marginal effects of the independent variables on the probability that a descendant will end in any of the three educational categories; Reference category of parental educational attainment: Education level 1 (ISCED 0–2)

\* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.001$ ; Robust standard errors are in parentheses

intergenerational transmission of economic success differs by gender and migration background.

In Table 2, we report the estimated average marginal effects of each explanatory variable on the probability that a male or female respondent achieves a particular level of education. With reference to the whole female and male sample, all included family background covariates are significant at the 99% level.

Our main variable of interest, the socioeconomic status index of the parental household, is illustrated in italic in the first row. It appears that a unit increase in the index significantly increases the probability to achieve a high level of education. More specifically, if the economic situation of the parental household is perceived to be better compared to the mean, the probability to attain a tertiary degree increases on average by 4.2 percentage points for male descendants and by 1.2 percentage points for female descendants, holding all other factors constant. Regarding the effect of parental education, the results indicate that children with more highly educated parents are indeed considerably more likely to have high levels of education themselves (these findings coincide with many other studies on intergenerational education mobility, such as those by Schneebaum et al. 2016). Having a father

with a tertiary education, instead of the lowest education level, increases, on average, the probability to hold a tertiary degree by 20.6 percentage points for male descendants, and by 26 percentage points for female descendants. Similarly, having a mother holding a university degree, compared to the reference category, has significant positive effects for descendants of both genders. It increases the probability for female descendants to achieve a high level of education by around 41 percentage points and by 32.5 percentage points for male descendants. By looking at the migration background coefficients, the first thing to note is that, in Austria, female descendants with a migration background face a significant lower chance to reach a tertiary education, irrespective of their parents' financial endowments and educational attainments. For male descendants with a migration background, it is particularly noteworthy that for those born in a non-EU country, the probability to obtain a university degree decreases, on average, by more than 13 percentage points, compared to male natives. The effects of family composition, more specifically the number of siblings in the parental household and whether one has grown up with both parents, show the expected significant sign for both genders.

**Table 3** Returns on the natural logarithm of gross hourly wages separated by gender, OLS-regressions. Source: EU-SILC 2011, Authors' calculations

Dependent variable: LogWage				
	Male sample	Female sample	Male sample	Female sample
<i>ES</i>	0.041*** (0.008)	0.014* (0.007)	0.056*** (0.009)	0.017** (0.008)
Exp	0.019*** (0.003)	0.014*** (0.003)	0.017*** (0.004)	0.017*** (0.004)
Exp <sup>2</sup>	-0.0003*** (0.0001)	-0.0001* (0.0001)	-0.0003*** (0.0001)	-0.0002** (0.0001)
Union	0.104*** (0.017)	-0.023 (0.016)	0.123*** (0.019)	-0.012 (0.017)
Education level 2	0.131*** (0.026)	0.211*** (0.021)	0.162*** (0.033)	0.252*** (0.025)
Education level 3	0.462*** (0.030)	0.613*** (0.025)	0.489*** (0.036)	0.657*** (0.029)
MB 2nd Gen	-0.054 (0.055)	0.069 (0.055)		
MB 1st Gen (other EU Member State)	-0.096*** (0.036)	-0.140*** (0.028)		
MB 1st Gen (non-EU Country)	-0.282*** (0.023)	-0.182*** (0.024)		
MB Dummy			-0.147 (0.105)	0.148* (0.084)
MB Dummy: ES			-0.051** (0.016)	-0.011 (0.017)
MB Dummy: Exp			0.007 (0.009)	-0.009 (0.007)
MB Dummy: Exp <sup>2</sup>			-0.0002 (0.0002)	0.0001 (0.0002)
MB Dummy: Union			-0.166*** (0.047)	-0.107** (0.042)
MB Dummy: Education level 2			-0.005 (0.053)	-0.126*** (0.045)
MB Dummy: Education level 3			0.038 (0.067)	-0.130** (0.058)
(Intercept)	2.210*** (0.045)	2.060*** (0.038)	2.183*** (0.053)	1.975*** (0.045)
Observations	2081	1949	2081	1949
Residual std. error	7.817 (df=2071)	6.849 (df=1939)	7.763 (df=2067)	6.864 (df=1935)

*Italic denotes main variable of interest*

\*p < 0.1; \*\*p < 0.05; \*\*\*p < 0.01; Robust standard errors are in parentheses

In Table 3, we now report the OLS estimates of Eq. (2), where the direct impact of the economic situation of the parental generation on hourly wages of the child generation, independent from the impact on educational attainment, takes center stage. The two left columns of Table 3 show the estimation results without migration background interaction terms for both the male and female subsample, and the two-right hand-side columns those with. The results reveal that a unit increase

in the socioeconomic status index increases, on average, the gross hourly wages of male descendants by 4.1% (respectively 5.6% within the interaction model) and by 1.4% (respectively 1.7%) of female descendants, holding all other factors constant. So, if the economic situation of the parental household is perceived to be better compared to the mean, the hourly wages of male descendants increases by more than 4% on average, and by more than 1.4% of female descendants. It turns out that the effect is

more significant and stronger for men than for women and in line with previous findings of studies on intergenerational social mobility (see e.g. Altzinger and Schnetzer 2013). Therefore, we are able to show that there is a considerable intergenerational association between the financial status of the parents and the actual wages of the descendants on top of the influence on descendants' educational outcomes. Moreover, the results indicate that there are only minor differences between natives and migrants with regard to the intergenerational transmission of economic success. While no differences can be found within the female sample, the difference between native men and those with a migration background is not very substantial: A perceived improvement in the economic situation of the parental household increases the gross hourly wages for native men by 5.6%, whereas it increases the wage for men with a migration background by only 0.5% on average. It is rather the direct effect of a migration background on attainable wages that is relevant. In particular men born in a non-EU country earn on average more than 28% less than native men. For women born in a non-EU country, wages are on average 18% lower than those of native women.

Of course, the effect of a higher level of education attained by descendants is positive and highly significant for their attainable wages. For women, a graduation in tertiary school compared to a graduation in primary school increases their gross hourly wages, on average, by more than 60% (respectively 65.7% within the interaction model), and a graduation in secondary school compared to a graduation in primary school raise their earnings on average by around 21% (respectively 25.2%). For men, on the other hand, the actual wages increase on average by 46.2% (respectively 48.9%) with a graduation in tertiary school and 13.1% (respectively 16.2%) with a graduation in secondary school compared to a graduation in primary school. In this regard, only significant differences between native and migrant women can be detected. The positive effect of a high level of education attained on hourly earnings is on average substantially lower for the latter compared to the former. Furthermore, an additional year of labour market experience increases the hourly wages on average by less than 2% for both sexes. However, this increasing effect diminishes as the number of years of labour market experience increases (shown by the negative and significant sign of the  $Exp^2$  coefficient). There are no observable differences between natives and migrants regarding the effect of labour market experience on earnings. Being in a consensual union with or without a legal basis has only a significant positive effect on hourly wages of native men, but not for native women nor for women and men with a migration background.

## 5.2 Estimates of the instrumental variable approach

In this section, we explore in more detail the direct intergenerational association between the economic situation of the parental household and the hourly wages of their children. To this aim, we present the estimation results of our instrumental variable wage equation investigation, where we model the socioeconomic status of the parental household within the intergenerational transmission system. Furthermore, we present how the effect of the endogenous modelled socioeconomic situation of the parental generation varies across the conditional wage distribution of the child generation.

Table 4 shows the estimation output of our instrumental variable approach. By endogenously modelling the socioeconomic status of parents, it becomes apparent, that we significantly underestimate the extent of the intergenerational economic association when applying ordinary least squares regressions only, where the perceived income situation is considered to be exogenously given like in the general approach above.

Within our instrumental variable approach, the perceived socioeconomic status of the parental generation is explained with a factor that is highly significant for the determination of an households' economic situation, namely, the number of children, which enables us to show that a unit increase in our socioeconomic status index increases the attainable wages of male descendants by more than 17% on average, respectively, by more than 12% of female descendants. An even stronger intergenerational economic association shows us the interaction model, but it should be noted that the explanatory power of the model with migration background interaction terms is not as high as that without interaction terms (the adjusted  $R^2$  value is higher for the latter than for the former). Beyond that, it is important to mention that our instrumental variable estimates probably suffer from an upward bias as a consequence of a conceivable correlation between our instrument and the error term of the second stage, which includes, *inter alia*, a person's cognitive and noncognitive skills as well as his/her physical appearance.

Apart from that, we can observe that the direction of impact of the other included explanatory variables [ $Exp$ ,  $Exp^2$ , Union, Education level 2, Education level 3, MB 2nd Gen, MB 1st Gen (other EU Member State), MB 1st Gen (non-EU Country)] have not changed compared to the OLS estimates of the general approach above, what can be considered as a sufficiently good robustness check. They differ only slightly in their magnitude. Anyway, the interpretation of the model parameters of the IV-regression results is identical to the interpretation of the model parameters of the simple OLS-regressions. As a further

**Table 4 Returns on the natural logarithm of gross hourly wages separated by gender, IV-regressions. Source: EU-SILC 2011, Authors' calculations**

Dependent variable: LogWage				
	Male sample	Female sample	Male sample	Female sample
<i>ES</i>	0.178*** (0.051)	0.124*** (0.045)	0.207*** (0.052)	0.141*** (0.047)
Exp	0.020*** (0.004)	0.016*** (0.004)	0.019*** (0.005)	0.022*** (0.004)
Exp <sup>2</sup>	-0.0003*** (0.0001)	-0.0001* (0.0001)	-0.0002*** (0.0001)	-0.0003*** (0.0001)
Union	0.107*** (0.020)	-0.006 (0.018)	0.127*** (0.023)	0.006 (0.020)
Education level 2	0.084** (0.036)	0.158*** (0.029)	0.113*** (0.044)	0.197*** (0.033)
Education level 3	0.353*** (0.045)	0.533*** (0.037)	0.385*** (0.051)	0.582*** (0.040)
MB 2nd Gen	-0.082 (0.064)	0.045 (0.061)		
MB 1st Gen (other EU Member State)	-0.091** (0.043)	-0.170*** (0.033)		
MB 1st Gen (non-EU Country)	-0.287*** (0.027)	-0.207*** (0.028)		
MB Dummy			-0.124 (0.126)	0.240** (0.095)
MB Dummy: Exp			0.007 (0.011)	-0.019** (0.009)
MB Dummy: Exp <sup>2</sup>			-0.0001 (0.0002)	0.0003 (0.0002)
MB Dummy: Union			-0.156*** (0.059)	-0.117** (0.047)
MB Dummy: Education level 2			-0.040 (0.063)	-0.133*** (0.049)
MB Dummy: Education level 3			-0.074 (0.081)	-0.179*** (0.064)
(Intercept)	2.214*** (0.053)	2.070*** (0.043)	2.177*** (0.064)	1.952*** (0.050)
Observations	2081	1949	2081	1949
R <sup>2</sup>	0.129	0.227	0.076	0.205
Adjusted R <sup>2</sup>	0.125	0.223	0.071	0.200
Residual std. error	9.668 (df= 2071)	8.129 (df= 1939)	9.964 (df= 2068)	8.247 (df= 1936)
Weak instruments	6.9e <sup>-09</sup> ***	5.44e <sup>-11</sup> ***	2.71e <sup>-09</sup> ***	8.54e <sup>-11</sup> ***
Wu-Hausman	0.00705***	0.00725***	0.000972***	0.00224***

*Italic denotes main variable of interest*

\*p < 0.1; \*\*p < 0.05; \*\*\*p < 0.01; Robust standard errors are in parentheses

robustness check and also to adequately address the issue of life-cycle biases (for more on that see for instance Blanden 2019), we reduce the data to middle-aged individuals (i.e. between 35 and 44 years old), so as to allow the intergenerational transmission process to display all its main effect. Therewith, it can be demonstrated that a

perceived improvement of the economic situation of the parental household, compared to the mean, increases the gross hourly wages of male and female descendants on average by around 23% for the former and more than 16% for the latter, whereby it appears that the intergenerational economic association for female offspring loses

**Table 5 Returns on the natural logarithm of gross hourly wages in different quantiles of male and female earning distributions; IVQR-regressions. Source: EU-SILC 2011, Authors' calculations**

Percentile of LogWage	Male sample					Female sample				
	0.10	0.25	0.50	0.75	0.90	0.10	0.25	0.50	0.75	0.90
<i>ES</i>	0.0475 (0.0366)	0.0212 (0.0481)	0.1387*** (0.0331)	0.1936** (0.0616)	0.2407*** (0.0679)	-0.0293 (0.0436)	0.0707* (0.0278)	0.0830* (0.039)	0.1716*** (0.0334)	0.3450*** (0.0648)
$\hat{\varphi}$	-0.0143 (0.0379)	0.008 (0.0488)	-0.0992** (0.0322)	-0.1572* (0.0623)	-0.1857** (0.0692)	0.0398 (0.0452)	-0.0682* (0.0292)	-0.0781 (0.0399)	-0.1586*** (0.0354)	-0.3233*** (0.0658)
Exp	0.0027 (0.0062)	0.0085 (0.0052)	0.0179*** (0.0034)	0.0314*** (0.005)	0.0244*** (0.0052)	0.0071 (0.004)	0.0098** (0.0037)	0.0122*** (0.0033)	0.0202*** (0.0053)	0.0256*** (0.0063)
Exp <sup>2</sup>	-0.0000 (0.0001)	-0.0001 (0.0001)	-0.0002*** (0.0001)	-0.0004*** (0.0001)	-0.0002 (0.0001)	-0.0001 (0.0001)	-0.0001 (0.0001)	-0.0001 (0.0001)	-0.0002 (0.0001)	-0.0002 (0.0001)
Union	0.1312*** (0.0275)	0.1164*** (0.0261)	0.1030*** (0.0207)	0.0760** (0.0259)	0.1226*** (0.0283)	0.0114 (0.0212)	-0.0131 (0.0269)	-0.0369* (0.0178)	0.0071 (0.0208)	0.0132 (0.0305)
Education level 2	0.1064* (0.0437)	0.0692 (0.0367)	0.0885*** (0.0235)	0.0817* (0.0391)	0.1319** (0.042)	0.0917*** (0.0251)	0.0924*** (0.0261)	0.1780*** (0.0286)	0.2174*** (0.0323)	0.1081* (0.0438)
Education level 3	0.1954** (0.0658)	0.2932*** (0.0548)	0.4236*** (0.0368)	0.4533*** (0.057)	0.4838*** (0.0562)	0.3865*** (0.0451)	0.4398*** (0.0418)	0.6016*** (0.0398)	0.6017*** (0.0426)	0.5341*** (0.0687)
MB 2nd Gen	-0.0293 (0.0255)	-0.1471*** (0.0303)	-0.0781 (0.0788)	-0.0473** (0.0175)	-0.1537*** (0.0356)	0.0045 (0.024)	0.0593 (0.181)	0.0685 (0.0704)	0.0295 (0.0733)	0.0069 (0.0325)
MB 1st Gen (other EU Member State)	-0.0917 (0.1790)	-0.0856 (0.0734)	-0.1574*** (0.0333)	-0.0878 (0.0620)	0.026 (0.1947)	-0.1319*** (0.0201)	-0.2123*** (0.0473)	-0.1641*** (0.0321)	-0.1675*** (0.0398)	-0.2059** (0.0661)
MB 1st Gen (non-EU Country)	-0.2279*** (0.0451)	-0.2741*** (0.0286)	-0.2544*** (0.0268)	-0.2866*** (0.0263)	-0.3180*** (0.0446)	-0.1249* (0.0496)	-0.1907*** (0.0176)	-0.1846*** (0.0262)	-0.2363*** (0.0602)	-0.2120*** (0.0359)
(Intercept)	2.0382*** (0.0835)	2.1725*** (0.0651)	2.2185*** (0.0394)	2.2930*** (0.0538)	2.4567*** (0.0547)	1.8762*** (0.0401)	1.9964*** (0.0418)	2.0980*** (0.0376)	2.1399*** (0.0592)	2.3265*** (0.0732)
Observations	2081									

*Italic denotes main variable of interest*

\*p < 0.1; \*\*p < 0.05; \*\*\*p < 0.01; Robust standard errors are in parentheses

considerable significance, respectively, disappears completely within the model without migration background interaction terms. Moreover, the analysis of the middle-aged sample suggests that, as far as the female sample is under consideration, an OLS estimation might provide more efficient estimates, shown by the Wu–Hausman test for the model without interaction terms (the detailed estimation output of the analysis of the reduced sample can be found in [Appendix](#)). In general, the empirical analysis so far reveals that the intergenerational association between the economic situation of parents and the economic success of their male offspring appears to be more significant and higher in their magnitude than that between the socioeconomic status of the parental household and their female offspring.

Finally, [Table 5](#) presents the output of the instrumental variable quantile regression estimation. We use this technique mainly to demonstrate how the effect of the endogenous modelled socioeconomic status of the parental generation vary across the conditional wage distributions of male and female descendants. Beyond that, the applied technique opens up an alternative way to think about the impact of a bundle of additional intergenerational transmission channels like cognitive ability, noncognitive personal traits and aspects of physical appearance, which are inherited biologically and through social learning processes, on an empirical level. This is possible by integrating the residuals from the first stage regression—where the endogenous variable  $es_i$  is explained by the family size—in the second stage. Since the residuals from the first stage capture a bundle of factors other than the integrated instrument that influence the socioeconomic status of the parental household, it can be reasonably assumed that these unobservable factors consist, *inter alia*, of cognitive ability, noncognitive personal traits, and aspects of physical appearance, and that this bundle of ‘soft factors’ is transmitted among generations.

[Table 5](#) shows that the extent of the intergenerational association between the economic situation of parents (demonstrated by the socioeconomic status coefficient **ES**) and the earnings of their children reaches its peak in 90th percentile of both male and female descendants wage distributions. A one-unit increase in the index (a perceived improvement in the socioeconomic situation of the parental household compared to the mean) increases the hourly wages in the 90th percentile of the men’s conditional wage distribution on average by around 24%, and by more than 34% in the 90th percentile of the

women’s wage distribution. Nevertheless, as we can see from the  $\hat{\delta}$  coefficient, this positive effect is mitigated by a bundle of additional intergenerational transmitted factors, which comprise, among other things, cognitive ability, noncognitive personal traits, and aspects of physical appearance. Across the entire male and female wage distributions, the magnitude of impact of this bundle is higher for women than for men, which in turn causes the net effect of the direct intergenerational economic association to be higher for men. Additionally, we can observe that both the influence of an improvement in the economic situation of the parental generation on actual earnings of the child generation and the impact of the bundle of additional intergenerational transmission factors is intensifying along the conditional male and female wage distributions.

The positive effect of a graduation in tertiary school compared to a graduation in primary school, respectively, the positive effect of a graduation in secondary school compared to a graduation in primary school, on wages is strongest in the upper half of both male and female earning distributions. Furthermore, by looking at the ethnic-origin effect, we can see that the most disadvantaged cohorts are male and female migrants from non-EU countries. In each quantile of the conditional wage distributions, they earn on average significantly less than native men and women. This can also be observed between female migrants born in another EU member state and native women, but not between migrant men from another EU member state and male natives. The positive impact of an additional year of labour market experience on wages is almost solely significant in the upper half of the conditional earnings distribution and there are hardly any gender differences in this respect. Being in a consensual union with or without a legal basis is only significant within the male sample and has its strongest impact on both ends of the earnings distribution.

## 6 Discussion and policy implications

In this paper, we investigated empirically the extent of the intergenerational transmission of economic success in Austria. We used data from the 2011 wave of the EU-SILC sample survey, which includes an ad-hoc-module on intergenerational mobility of disadvantages, and followed Franzini and Raitano (2009) by applying a two-step estimation procedure, where we explored the intergenerational association between the economic situation of the



parental household and educational attainments as well as gross hourly wages of their male and female descendants independently. Furthermore, we attempted to shed some light on the intergenerational social mobility black box by endogenizing the direct effect of the income situation of the parental generation on attainable wages of the child generation. It turned out that by explaining the socioeconomic status of the parental household within the intergenerational transmission process rather than taking it as exogenous, we opened up an alternative way to think about the impact of a complex of additional transmission mechanism channels on an empirical level. Those channels comprise, among other things, cognitive ability, noncognitive personal traits and aspects of physical appearance. Apart from that, we assumed that income persistence affects some population groups more severely and so we paid special attention to migrants within the intergenerational transmission of economic success process, but also to the differences between men and women.

Our estimation output confirms that a perceived improvement of the economic situation of the parental household, compared to the mean, has a significant positive effect on educational achievements of both male and female descendants. Furthermore, we identified a direct significant positive effect of an improvement of the socioeconomic status of parents on wages earned by their sons and daughters (for the former it amounts to 4% and for the latter to 1.4% on average), independent of school achievements. Although these results already show a significant positive direct intergenerational economic association, once we take the endogeneity of the socioeconomic status of the parental generation into account, we instead observe an effect of more than 17% for hourly wages of male descendants and more than 12% for hourly wages of female descendants. Therefore, our results indicate that by applying OLS-regressions only, where the economic situation of the parental generation is taken exogenous, one can significantly underestimate the transmission of economic success among generation. We detected only minor differences between migrants and natives with regard to intergenerational social mobility, but our results showed that a migration background itself has a substantial negative effect on earnings as well as on educational achievements of both male and female descendants. Finally, we applied an instrumental variable quantile regression, with which we demonstrated how the effect of the endogenous modelled economic

situation of the parental generation varies across the conditional wage distribution of the child generation. With our measure of the economic situation of the parental household (the socioeconomic status index), we showed that a one unit increase in the index (a perceived improvement in the economic situation compared to the mean) increases the hourly wage in the 90th percentile of the men's conditional wage distribution on average by around 24%, and by more than 34% in the 90th percentile of the women's wage distribution. However, this positive effect is mitigated by a bundle of 'soft factors', which consists, *inter alia*, of cognitive ability, noncognitive personal traits and aspects of physical appearance that are inherited biologically and through social learning processes. A few studies already highlighted the relative importance of these determinants that are not generally considered to be factors of production (see e.g. Blanden et al. 2007 or Bowles and Gintis 2002). Beyond that, our empirical analysis revealed that, in Austria, the intergenerational association between the economic situation of parents and the economic success of their male offspring is, on average, more significant and higher in their magnitude than that between the socioeconomic status of the parental household and their female offspring.

For policy makers aiming for social mobility between generations in order to compensate for socioeconomic disadvantages, this research suggests some key areas of intervention, although they have to be read with caution. As the results presented here are only a small and very incomplete view inside the intergenerational social mobility black box, they cannot be interpreted as an identification of the underlying causal mechanisms. Thus, it is not possible to derive clear social and economic policy responses. Furthermore, the regression output also indicate that the intergenerational transmission of economic success depends on additional factors like cognitive ability, noncognitive personal traits and aspects of physical appearance that make policy interventions in this area a complex issue. However, useful policy interventions can focus on the strong relationship between the economic situation of the parental household and the educational achievements as well as the labour market outcomes of their children. Resources could be directed at programs that improve the educational outcomes of children from destitute families, since the socioeconomic status of the parental household sets the limits for investments into children.

This can be accomplished by education or family policy measures that are more effective for poor families, for instance through investment in high quality pre-school childcare or by directing resources to poorer schools respectively to schools with high numbers of migrant pupils. Such policy interventions can have a decisive influence on later attainable wages and the distribution of incomes.

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#### Authors' contributions

DR prepared, analysed, and interpreted the data used in this study. Furthermore, DR wrote the abstract, introduction, a major part of the literature overview, the methods, results, and the conclusion sections of the paper. MP was partly involved in the data preparation, the method selection, and the

interpretation of the investigation on the intergenerational link between the economic situation of parents and the educational outcomes of their children. In addition, he wrote the data section of the paper and parts of the literature overview. MK primarily fulfilled a coordination function. All authors read and approved the final manuscript.

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#### Availability of data and materials

The data that support the findings of this study are available from the *Statistical Office of the European Union (Eurostat)*, but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of *Eurostat*.

#### Competing interests

The authors declare that they have no competing interests.

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## Appendix

Variable	Variable definition
LogWage	Natural logarithm of the gross hourly wage of the respondent
Education level	Highest education levels reached by the respondents (1 'ISCED 0-2', 2 'ISCED 3-4', 3 'ISCED 5-6')
Exp	Work experience—Number of years spent in paid work
Exp <sup>2</sup>	Work experience squared
Age	Respondent's age in years at the date of interview
Union	Dummy variable equal to one if the respondent lives in a consensual union (both on a legal basis and without a legal basis)
No. of siblings in parental household	Number of children living in the same household as the respondent when he/she was 14 years old
Living with both parents	Dummy variable equal to one if the respondent grew up with both parents
MB dummy	Dummy variable equal to one if both parents of the respondents were not born in Austria
MB Gen	Categorical Variable for Migration Background (0 'Natives', 1 '2nd generation', 2 '1st generation born in another EU-Member State', 3 '1st generation born in a non-EU Country')
FS	Financial situation of the household in which the respondent lived when he/she was 14 years old (ranging from 1 'very bad' to 6 'very good')
AM	Respondent's feeling about the level of difficulty experienced by the household, in which the respondent lived when he/she was 14 years old, in making ends meet (ranging from 1 'with great difficulty' to 6 'very easily')
ES	Principle component analysis—FS and AM

See Table 6.

**Table 6 Robustness check with individuals of the age group 35–44; IV-regressions. Source: EU-SILC 2011, Authors' calculations**

Dependent variable: LogWage				
	Male sample	Female sample	Male sample	Female sample
ES	0.270** (0.110)	0.128 (0.088)	0.231** (0.099)	0.168* (0.095)
Exp	0.019 (0.023)	0.020 (0.013)	0.037* (0.022)	0.038** (0.018)
Exp <sup>2</sup>	-0.0004 (0.001)	-0.0004 (0.0004)	-0.001* (0.001)	-0.001* (0.0005)
Union	0.105*** (0.038)	-0.007 (0.030)	0.131*** (0.041)	-0.008 (0.034)
Education level 2	0.083 (0.087)	0.143** (0.060)	0.129 (0.086)	0.193*** (0.069)
Education level 3	0.327*** (0.118)	0.508*** (0.082)	0.368*** (0.106)	0.544*** (0.092)
MB 2nd Gen	-0.212* (0.115)	0.037 (0.150)		
MB 1st Gen (other EU Member State)	-0.355*** (0.069)	-0.231*** (0.054)		
MB 1st Gen (non-EU Country)	-0.252*** (0.048)	-0.256*** (0.044)		
MB Dummy			0.462 (0.449)	0.340 (0.251)
MB Dummy: Exp			-0.074 (0.047)	-0.043 (0.028)
MB Dummy: Exp <sup>2</sup>			0.002* (0.001)	0.001 (0.001)
MB Dummy: Union			-0.140 (0.115)	-0.036 (0.082)
MB Dummy: Education level 2			-0.088 (0.116)	-0.213*** (0.081)
MB Dummy: Education level 3			-0.0001 (0.150)	-0.095 (0.123)
(Intercept)	2.338*** (0.257)	2.139*** (0.135)	2.138*** (0.247)	1.907*** (0.179)
Observations	709	690	709	690
R <sup>2</sup>	0.013	0.239	0.109	0.178
Adjusted R <sup>2</sup>	0.001	0.229	0.094	0.163
Residual std. error	9.497 (df=699)	7.676 (df=680)	9.044 (df=696)	7.998 (df=677)
Weak instruments	0.00965***	0.00141***	0.00443***	0.00321***
Wu–Hausman	0.01207**	0.17499	0.02403**	0.08091*

\*p < 0.1; \*\*p < 0.05; \*\*\*p < 0.01; Robust standard errors are in parentheses

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