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Does human capital compensate for population decline?☆

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ABSTRACT

Fertility rates have been falling persistently over the past 50 years in most rich countries. Simultaneously, the trend of outward migration from poorer to richer countries has been steady. These two forces contributed to population aging, and – in an increasing number of countries – even to population decline. In this paper, we quantify the effect of decreasing fertility on the aggregate human capital stock. In doing so we take into account that parents with fewer children may raise investments in their children's education and health. We find that the human capital impact of declining fertility is partly compensated through such responses when including the full set of countries in our regressions. For the subset of countries that experience population decline, the compensatory effect is weaker and, in many specifications, even insignificant.

Introduction

Fertility rates have been falling persistently over the past 50 years in most countries. At the same time, substantial outward migration from poorer to richer countries has taken place. These two forces have contributed to population aging, and – in some countries – even to population decline. Fig. 1 illustrates the expected changes in the population levels between the five-year time periods 2015–2020 and 2030–2035 from a global perspective. We observe that population decline is expected to be particularly pronounced in Eastern Europe and in some East Asian countries.

What are the long-term economic consequences of these developments? The answer to this question depends to a great extent on whether declining population growth can be compensated by other factors such as human capital accumulation and immigration. In this paper, we focus on the analysis of the former and control for the latter to empirically quantify the changes in aggregate human capital given the observed fertility declines and increases in education and health investments.

The quality-quantity tradeoff as explored by Becker (1960), Barro and Becker (1989), and Becker et al. (1990) shows that parental fertility levels and children's education and health are inversely related. Children's education and their health are the key components of their human capital, which, in turn, determines the aggregate human capital stock of the workforce after children have turned adults. Aggregate human capital as such plays an important role for economic growth because (i) higher human capital means greater individual productivity, which increases output directly (Lucas, 1988; Lee and Mason, 2010; Mason et al., 2016), and (ii) higher human capital enhances research and development (R&D) and thereby technological progress and productivity growth (Romer, 1990; Strulik et al., 2013). Thus, aggregate human capital is a key driver of long-run economic development (cf. Bils and Klenow, 2000; Mincer, 1981; Galor and Tsiddon, 1997; Galor, 2005, 2011; Lee and Mason, 2010; Lutz et al., 2008; Strulik et al., 2013) and thereby also of the well-being of the population (Jones and Klenow, 2016; Bloom et al., 2021).

Fig. 2 displays the relation between fertility (obtained from the World Bank, henceforth WB) and the human capital index[1] (obtained from the Penn World Tables 10.0 revision, hereafter PWT), showing an inverse relation and, thus, supporting the quality-quantity tradeoff hypothesis. Thus, one would expect that at least a part of the potentially negative economic consequences of declining fertility could be compensated by the accompanying increases in education and health investments (Prettner et al., 2013; Kotschy and Sunde, 2018).

In this context, it is important to note that the effect of an increase in education levels by one year on the aggregate economy is not as straightforward as it may seem. This is because the increase by one year

☆ Note that this paper is based on our previous working paper "Does human capital compensate for depopulation?" (Siskova et al., 2022).

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[1] The Human capital index is a measure comprised of an individual's years of education and the return on investment in education in economic terms. It captures the skills acquired through education, which are used in the production process, where they improve labour productivity.

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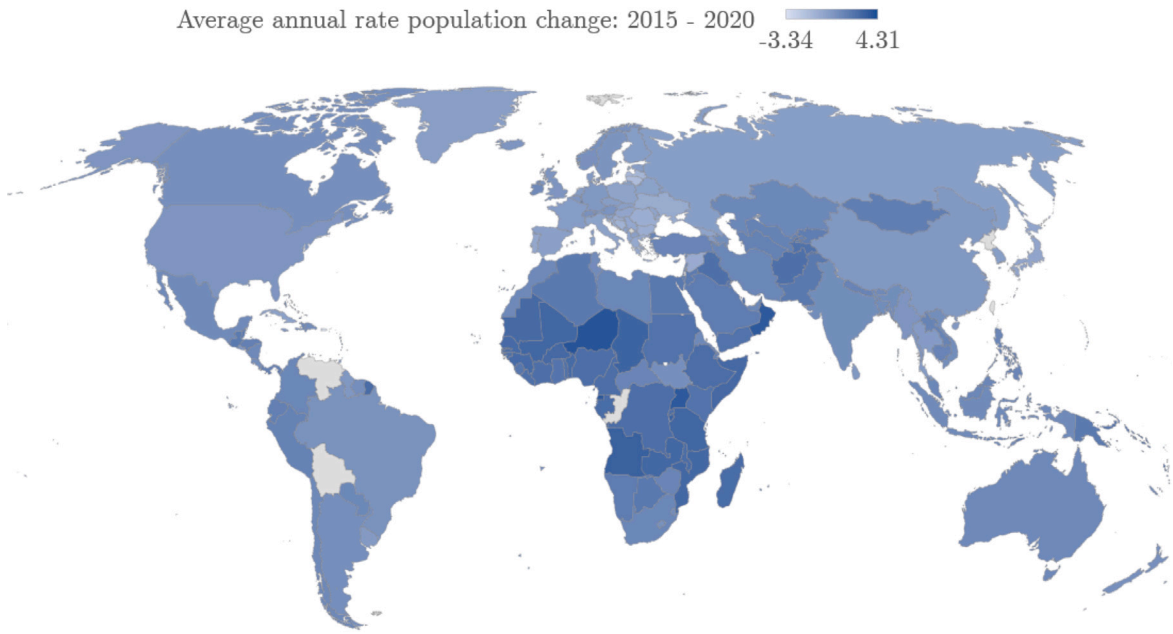
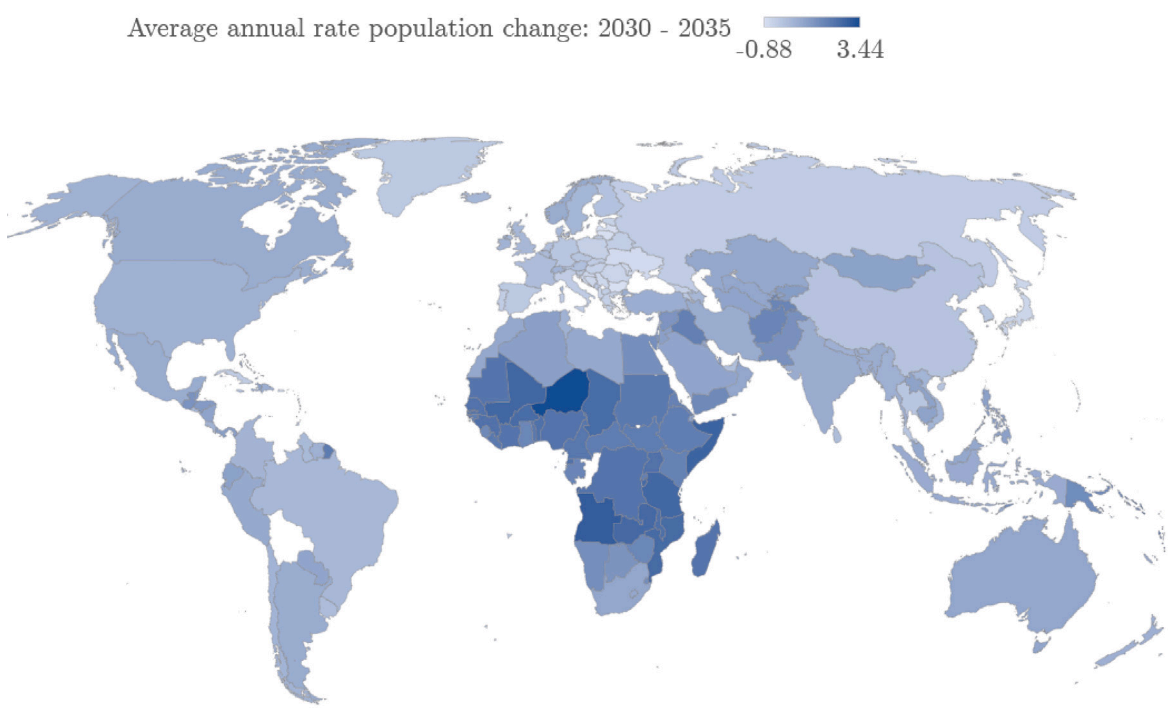


(a) Average annual rates of population change 2015-2020



(b) Average annual rates of population change 2030-2035

Fig. 1. Average annual rates of population change are represented by the distinct shades of blue. The darker shades depict faster population growth, whereas the pale shades describe areas with low population growth and even population decline.
Source: World Population Prospects (2022).

of schooling in a country with high levels of education (10–12 years of schooling) may yield different economic gains as compared to a country with mostly primary education (up to 6 years of schooling). The reason is that an increase from a low level implies that central skills such as reading and maths are learned or extended that are essential in almost all jobs and enable a further expansion of knowledge later on in life. By contrast, in a country with a higher education level, additional knowledge is comparatively specialized and the associated economic impact may be different. We address this issues by our construction of alternative human capital measures that allow for non-linearity.

Declining fertility is often complemented by net outward migration as a second important driver of population decline. This is often caused by a skill mismatch on the labour market and/or by low wages for highly-skilled and mobile parts of the population. Highly educated

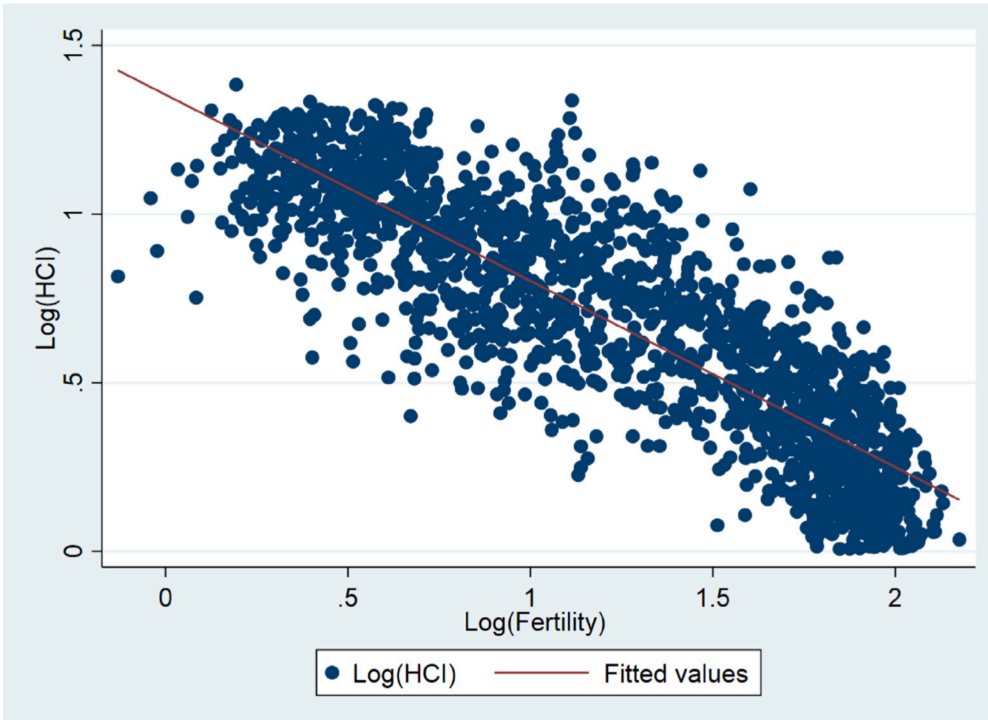


Fig. 2. Five year averages of the logarithmic transformations of the human capital index (Henceforth HCI from PWT) and the fertility rate (from WB) from 1960 to 2015.

workers are therefore more likely to emigrate to richer countries (Borjas, 2005), which diminishes the economic gains from higher education and thereby the compensatory effect of the quality-quantity trade-off in such settings. We therefore deem it important to control for migration in our empirical analysis, which is another contribution to previous analyses in this area.

Overall, we contribute to the literature on the scope for human capital investments to offset fertility decline along four dimensions: We extend the standard framework by (i) including migration to control for a crucial demographic force that affects human capital accumulation; (ii) splitting the sample into countries that are subject to population decline and countries that are not, which allows us to compare the strength of the compensatory mechanisms across countries with different demographic backgrounds. This is important because if the compensatory effect was much stronger in countries with population decline than in countries in which the population is still growing, then population decline may not be of such a concern for policymakers; (iii) including more control variables such as absence of corruption, the share of agriculture, and the quality of institutions, which are important determinants of economic growth that could, in principle, affect our results; and (iv) extending the sample size by including more countries and time points.

The remainder of the study is structured as follows. In Section “Theoretical considerations”, we describe how individual human capital can compensate for declining fertility within a production function framework. In Section “Empirical analysis”, we present the data and the empirical strategy that we follow. Section “Results” is devoted to the description of our findings and in Section “Conclusion”, we summarize our results and present scope for further research.

Theoretical considerations

We consider an economy in which time t evolves discretely. Final output at time t, Y_t, is produced employing physical capital, K_t, and aggregate human capital, H_t. Aggregate human capital, in turn, is determined by the fertility rate, n_t, multiplied with the size of the previous generation, N_{t-1}, and with individual human capital, h_t, such that $H_t = n_t h_t N_{t-1}$. Given the state of technology, A_t, aggregate production amounts to

$$Y_t = A_t K_t^{\alpha} H_t^{1-\alpha} = A_t K_t^{\alpha} \left(n_t h_t N_{t-1}\right)^{1-\alpha}, \quad (1)$$

where α is the elasticity of output with respect to physical capital. Individual human capital h_t measures embodied productivity as determined by, e.g., years of schooling (as a proxy for education) and the adult survival rate (as a proxy for health). Overall, the economic consequences of changing fertility depend crucially on whether education and health investments rise in response to declining fertility to an extent that offsets the negative effect of falling fertility. Mathematically, the effect of declining fertility on economic growth depends on the elasticity of individual human capital with respect to fertility in the following ways:

$$\frac{\partial h_t}{\partial n_t}\cdot\frac{n_t}{h_t} \begin{cases} \in (-\infty,-1) & \text{overcompensated,} \\ = -1 & \text{exactly compensated,} \\ \in (-1,0) & \text{partly compensated,} \\ = 0 & \text{not compensated,} \\ \in (0,\infty) & \text{inconsistent with quality-quantity trade-off.} \end{cases} \quad (2)$$

As far as aggregate human capital is concerned, these cases state that a country’s fall in fertility is (a) being overcompensated by an increase in education and health investments for values of the elasticity lower than −1, (b) partly compensated for values of the elasticity between −1 and 0, or (c) exacerbated for values of the elasticity greater than zero. These ranges are separated by the knife-edge cases of full compensation precisely at the value of −1 and no compensation precisely at the value of 0. Values above 0 are inconsistent with the presence of a quality-quantity trade-off along the lines of Becker (1960), Barro and Becker (1989), and Becker et al. (1990) that implies a negative relation between fertility and education. However, the scenario may occur under special circumstances, in which a country's fertility rate is low due to a struggling economy that deters parents from having many children and, at the same time, implies that the few children are malnourished and lack a decent education. This may be relevant, for instance, in countries affected by infectious diseases as a primary cause of child mortality.

Empirical analysis

In this section, we estimate the elasticity of human capital with respect to fertility. Note that neither the estimation of this elasticity nor the economic implications of the estimates depend on the direction of causality or on whether the changes are driven by unobserved third factors.

The data

To estimate the impact of fertility dynamics on human capital, we use the Human Capital Index (henceforth HCI) from the PWT as a proxy for human capital in our benchmark regressions. This index is based on education, measured by average years of schooling from Barro and Lee (2013) and Cohen and Leker (2014), to which a rate of return on education is applied that draws on the parameter estimates of a Mincer equation by Psacharopoulos (1994). However, the HCI has been criticized because it may be viewed as incomplete when it comes to capturing human capital (e.g., due to the exclusion of individual health). Hence, we constructed alternative measures of human capital based on Hall and Jones (1998), Bils and Klenow (2000), Prettner et al. (2013), and Jones (2014) and used them in our sensitivity analyses. Altogether, we constructed four measures of the human capital stock with two distinct sub-categories. The first category of the human capital stock uses average years of schooling and is constructed as follows:

$$h_{i,t} = e^{\mathrm{RoH}_{i,t} \cdot S_{i,t} + \mathrm{RoE}_{i,t} \cdot ys_{i,t}}, \quad (3)$$

where $h_{i,t}$ is the average human capital stock of the working age population in country i in time t, $\mathrm{RoH}_{i,t}$ is the return on health as in Bloom et al. (2019), $S_{i,t}$ is the adult survival rate, $\mathrm{RoE}_{i,t}$ refers to the return on education as surveyed in Psacharopoulos and Patrinos (2018), and $ys_{i,t}$ represents the average years of schooling. In including health alongside education, we follow Shastry and Weil (2003) and Weil (2007) who showed that health, as measured by the adult survival rate, has a non-negligible long-term impact on the productivity of the labour force.

Alternatively, we construct human capital in a more detailed way as

$$h_{i,t} = e^{\mathrm{RoH}_{i,t} \cdot S_{i,t} + \mathrm{RoE}_{i,t}^{prim} \cdot ys_{i,t}^{prim} + \mathrm{RoE}_{i,t}^{sec} \cdot ys_{i,t}^{sec} + \mathrm{RoE}_{i,t}^{tert} \cdot ys_{i,t}^{tert}}, \quad (4)$$

where we distinguish between the different levels of schooling, primary ($prim$), secondary (sec), and tertiary ($tert$) because they are likely to have different effects on productivity. In constructing this measure for average human capital, we take the returns to the different levels of education from Hall and Jones (1998).

For each specification, we employ two distinct sources for the return on health $\mathrm{RoH}_{i,t}$. Overall, this gives us four possible measures of the human capital stock, HCS1–HCS4, as presented in the 2x2 matrix in Table 1. HCS1 and HCS2 rely on the return on health assumed by Prettner et al. (2013) and HCS3 and HCS4 rely on the return on health estimated by Weil (2007). HCS1 and HCS3 are constructed following Eq. (3), whereas HCS2 and HCS4 follow Eq. (4). The values of the corresponding RoE and RoH measures are given in Table 2.

We retrieved data on fertility ($Fert$), the population size, the adult survival rate, and gross fixed capital formation (GFCF) from the World Bank. Net Migration (Mig) stems from the Wittgenstein Centre Human Capital Data Explorer. The data on GDP and the HCI have been retrieved from the PWT, where we compute per capita GDP ($GDPperCap$) using the population size data. The source for the education data is the Barro-Lee Educational Attainment Dataset (Barro and Lee, 2013). In addition, absence of corruption ($Corr$) was retrieved from The Global State of Democracy Indices and the value added of the agricultural sector as a share of GDP ($Agri$) was taken from the FAO. The summary statistics are depicted in Table 3, where we apply a logarithmic transformation to all variables except for migration. Furthermore, $Trade$ represents exports and imports as a share of GDP. Note that a negative (positive) value of the variable Mig represents emigration (immigration) from (to) the corresponding country. The variables $NetOutFlow$ and $NetInFlow$ then represent the split of the variable Mig, where only the negative or positive side of the measure Mig is included, expressing the net outflow or net inflow migrant share of the population, respectively.[2]

Table 1
Human capital stock and the data sources for each measure.

$\mathrm{RoH}_{i,t}$ from	Prettner et al. (2013)	Weil (2007)
Eq. (3)	HCS1	HCS3
Eq. (4)	HCS2	HCS4

Table 2
Values for all measures included rounded to 4 decimal spaces.

	Measure	Value
RoE	Average Mincerian	0,087
	Primary	0,078
	Secondary	0,105
	Tertiary	0,129
RoH	Strulik et al. (2013)	0,091
	Weil (2014)	0,067

Table 3
Summary statistics.

Variable	Mean	Std. Dev.	Min.	Max.	N
Log(HCI)	0.671	0.359	0.007	1.384	1737
Log(HCS1)	0.522	0.292	0.022	1.234	1573
Log(HCS2)	0.525	0.305	0.021	1.341	1573
Log(HCS3)	0.506	0.289	0.016	1.214	1573
Log(HCS4)	0.51	0.302	0.016	1.32	1573
Log(GDPpercap)	7.772	1.625	3.385	11.615	1171
Log(Fert)	1.369	0.53	−0.131	2.176	2412
Mig	−0.001	0.058	−0.312	0.764	1978
NetOutFlow	−0.01	0.024	−0.312	0	2818
NetInFlow	0.013	0.047	0	0.764	1978
Agri	0.147	0.151	0	0.8	1559
GFCF	0.214	0.11	0.014	1.457	2008
Corr	0.468	0.208	0.009	1	1393
Trade	0.778	0.531	0.002	5.947	1654

Benchmark regressions

Given the structure of our data and its sources, we have an unbalanced panel with gaps. We use 5-year averages to account for fluctuations caused by business cycles. This allows us to analyse $T = 11$ periods from 1965 to 2015. We construct our benchmark regression using a fixed effects model to account for a country's individual characteristics in the following manner:

$$\log(h_{i,t}) = \beta_0 + \beta_1 \log(\mathrm{Fert}_{i,t-n}) + \beta_2(\mathrm{Mig}_{i,t}) + \beta_3 X_{i,t} + \varepsilon_{i,t}, \quad (5)$$

[2] Note that, whenever the Mig variable has a positive value and cannot be included in the $NetOutFlow$ variable, we include a zero in our observations because it is not a missing variable but rather a point in time where no net out-migration is observed.

Table 4
Results for all countries using HCI as a measure of human capital.

VARIABLES	(1) HCI No Mig	(2) HCI Mig
Fert	−0.128***	−0.124***
	(0.016)	(0.016)
Mig		−0.101*
		(0.058)
Observations	815	779
R-squared	0.842	0.840
Number of id	102	97
State FE	YES	YES
Year FE	YES	YES

[a] St. errors in parentheses, $***p < 0.01$, $**p < 0.05$, $*p < 0.1$.
[b] Fert represents a lag of 2 for log(Fertility).
[c] Mig is the net migration share of the population.
[d] The controls include the log of GDP per capita, the share of agriculture, absence of corruption, gross fixed capital formation, and trade as a share of GDP. For the full table see Tables A.1–A.10.

Table 5
Results for depopulation countries.

VARIABLES	(1) HCI No Mig	(2) HCI Mig
Fert	−0.082***	−0.054**
	(0.025)	(0.025)
Mig		−0.557***
		(0.159)
Observations	153	142
R-squared	0.914	0.927
Number of id	22	20
State FE	YES	YES
Year FE	YES	YES

[a] St. errors in parentheses, $***p < 0.01$, $**p < 0.05$, $*p < 0.1$.
[b] Fert represents a lag of 2 for log(Fertility).
[c] Mig is the net migration share of the population.
[d] The controls include the log of GDP per capita, the share of agriculture, absence of corruption, gross fixed capital formation, and trade as a share of GDP. For the full table see Tables A.1–A.10.

where $\log(h_{i,t})$ represents the human capital index in country i at time t, which is impacted primarily by the fertility rate $\log(\text{Fert}_{i,t-n})$ at time $t-n$ and net migration ($\text{Mig}_{i,t}$) at time t. We account for the fact that the changes in fertility have a delayed impact on the human capital indicator and, hence, include the lag n of fertility instead of the current period t. The other control variables are contained in the matrix $X_{i,t}$, while $\varepsilon_{i,t}$ is the composite error term. Note that in some of our robustness checks, we also include migration with lags 1 and 2.

Results

Benchmark regression results

Our baseline regression follows the specification in Eq. (5) and includes fixed effects based on the results of the Hausman test. Table 4 depicts the coefficient estimates for our main explanatory variables including fertility and migration. In case of fertility, the coefficient has the interpretation of an elasticity. We find that the aggregate human capital loss following the reduction in the workforce when fertility declines is being partly compensated by a 0.124% increase (at the 1% significance level) in individual human capital through education and health investments. Thus, a 1% fertility drop is associated with an increase of 0.124% in average human capital. This finding is qualitatively and quantitatively consistent with the literature to date (Prettner et al., 2013).

The net migration share of the population[3] in our benchmark regression is found to be negative and statistically significant at the 10% level. Note that the net migration share is not in logs and hence its interpretation differs. The negative sign of the association between net migration and average human capital is consistent with a composition effect that arises when (a) there is a cascading flow of migration from low-income countries with a lower average level of human capital to high-income countries with a higher average level of human capital and (b) the human capital of migrants exceeds the average human capital in the country of origin but falls short of the average human capital in the host country. Such a pattern would imply that migration reduces average human capital in both the country of origin and the receiving country.

To capture the association between fertility and aggregate human capital in countries affected by population decline, we run our benchmark regression maintaining the same control variables but for the sub-sample comprised solely of countries experiencing population decline. The trend of declining population can be attributed to long-term fertility decline or outward migration tendencies or a combination of both. The 50 countries with the strongest decline in their predicted population size based on the United Nation's World Population Prospects have been selected into this group. Note that, in some regressions, this number is lower due to an insufficient number of observations. The results are depicted in Table 5.

We find that the elasticity of human capital with respect to changes in fertility is −0.082% (p<0.01) without controlling for migration and (in absolute terms) reduces to −0.054% (p<0.05) when including migration in the specification. Hence, the results again indicate a partial compensation of the effect of fertility decline on aggregate human capital accumulation. However, the magnitude of the compensatory effect is smaller in countries with population decline than in the full set of countries. Additionally, the relation between the net migration share of the population and human capital in countries with declining populations is both negative and statistically significant at the 1% level.

Sensitivity analysis

To verify the robustness of our results, we use the constructed human capital stocks (see Table 1). These include health effects and allow for differences in the effect of the various levels of educational attainment on productivity. The results of our sensitivity analyses and the contrast between the results based on HCI versus HCS is depicted in Table 6. Overall, our main results are robust across the different measures of human capital. However, we do find lower values of the compensation effect of fertility decline on human capital for HCS's compared to HCI in regressions both with and without migration. This difference between HCI and HCS is about 0.04 percentage points in most cases.

We also conduct the sensitivity analysis including HCI and HCS for countries with declining populations (see Table 7). However, we find that HCS measures are mostly statistically insignificant. Only HCI is statistically significant before and after the inclusion of migration. Furthermore, the fertility elasticities in all human capital stocks are bearing a positive sign. If they were statistically significant, they would imply that the quality-quantity trade-off itself was not consistent with the data. Overall, the results are in line with our main finding that the compensatory effect of rising human capital investments in case of fertility decline is weaker in countries with population decline than in countries with population growth.

[3] Net migration represents the difference between immigration and emigration in relation to a country's population size.

Table 6
Results for all countries and all measures of human capital — both HCI and HCS.

VARIABLES	(1) HCI No mig	(2) HCI Mig	(3) HCS1 No Mig	(4) HCS1 Mig	(5) HCS2 No Mig	(6) HCS2 Mig	(7) HCS3 No Mig	(8) HCS3 Mig	(9) HCS4 No Mig	(10) HCS4 Mig
Fert	−0.128***	−0.124***	−0.082***	−0.084***	−0.080***	−0.081***	−0.082***	−0.083***	−0.080***	−0.081***
	(0.016)	(0.016)	(0.014)	(0.014)	(0.015)	(0.015)	(0.014)	(0.014)	(0.015)	(0.015)
Mig		−0.101*		−0.017		−0.023		−0.019		−0.025
		(0.058)		(0.044)		(0.049)		(0.045)		(0.049)
Observations	815	779	693	662	693	662	693	662	693	662
R-squared	0.842	0.840	0.871	0.871	0.871	0.871	0.869	0.868	0.869	0.868
Number of id	102	97	98	93	98	93	98	93	98	93
State FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

[a] Standard errors in parentheses, $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.
[b] Fert represents a lag of 2 for log(Fertility).
[c] Mig is the net migration share of the population
[d] The controls included the logarithmic transformation of GDP per capita, the share of agriculture, absence of corruption, gross fixed capital formation, and trade as a share of GDP. For the full table see Tables A.1–A.10.

Table 7
Results for depopulation countries using all measures of human capital — both HCI and HCS.

VARIABLES	(1) HCI No mig	(2) HCI Mig	(3) HCS1 No Mig	(4) HCS1 Mig	(5) HCS2 No Mig	(6) HCS2 Mig	(7) HCS3 No Mig	(8) HCS3 Mig	(9) HCS4 No Mig	(10) HCS4 Mig
Fert	−0.082***	−0.054**	0.031	0.051*	0.039	0.055	0.031	0.051*	0.040	0.055
	(0.025)	(0.025)	(0.029)	(0.029)	(0.035)	(0.036)	(0.029)	(0.029)	(0.035)	(0.036)
Mig		−0.557***		−0.209		−0.086		−0.212		−0.089
		(0.159)		(0.177)		(0.217)		(0.177)		(0.217)
Observations	153	142	131	122	131	122	131	122	131	122
R-squared	0.914	0.927	0.938	0.947	0.931	0.938	0.937	0.946	0.930	0.937
Number of id	22	20	22	20	22	20	22	20	22	20
State FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

[a] Standard errors in parentheses, $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.
[b] Fert represents a lag of 2 for log(Fertility).
[c] Mig is the net migration share of the population.
[d] The controls included the logarithmic transformation of GDP per capita, the share of agriculture, absence of corruption, gross fixed capital formation, and trade as a share of GDP. For the full table see Tables A.1–A.10.

Conclusion

We study how fertility decline is compensated by increases in education and health investments. To this end, we extend the standard framework by (i) including migration to control for a crucial demographic force that affects human capital accumulation, (ii) considering a sub-sample of countries that are subject to population decline in addition to the full sample of all countries, (iii) including more control variables such as absence of corruption, the share of agriculture, and the quality of institutions, and (iv) extending the database by including more countries and time points. We also use different measures for the human capital stock to carry out extensive sensitivity analyses.

Overall, we find that declining fertility is being partly compensated by increasing education and health investments when all countries are included in our regressions. According to our results, the elasticity of individual human capital with respect to fertility is about −0.124%. This elasticity is reduced when we only consider the countries that face population decline; it is further reduced when migration is included as a control variable. This implies that countries subject to population decline are in a more difficult position to compensate for the human capital effects of declining fertility.

Promising avenues for future research include studying the impact of fertility changes on per capita GDP growth in countries with declining populations and to disentangle the effects of emigration and immigration on human capital measures.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix

The appendix is comprised of Tables A.1–A.10 containing regressions with different measures for migration. Furthermore, each regression uses a distinct lag specification for each measure of migration. The tables are either those for the full sample or for the sub-sample of countries with declining populations. Five tables for each — full and sub-sample — correspond to the different measures of human capital used as a dependent variable. One measure of human capital is retrieved from the PWT 10.0 and the other four we constructed (see Table 1). Overall, the results in this appendix show that our main insights remain robust.

Table A.1
Complete results for all countries using HCI as a dependent variable.

VARIABLES	(1) No Mig	(2) Mig	(3) Net Mig L1	(4) Net Mig L2	(5) Net In Mig	(6) Net In Mig L1	(7) Net In Mig L2	(8) Net Out Mig	(9) Net Out Mig L1	(10) Net Out Mig L2
Fert	−0.128***	−0.124***	−0.124***	−0.125***	−0.124***	−0.124***	−0.124***	−0.128***	−0.127***	−0.129***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
GDPpercap	−0.022***	−0.022***	−0.025***	−0.024***	−0.023***	−0.025***	−0.024***	−0.021***	−0.022***	−0.023***
	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)
Mig		−0.101*								
		(0.058)								
Agri	−0.177***	−0.169***	−0.179***	−0.171***	−0.168***	−0.186***	−0.173***	−0.184***	−0.177***	−0.175***
	(0.058)	(0.059)	(0.060)	(0.059)	(0.060)	(0.060)	(0.059)	(0.058)	(0.058)	(0.058)
GFCF	−0.054	−0.054	−0.055	−0.052	−0.053	−0.057	−0.053	−0.058	−0.054	−0.053
	(0.036)	(0.037)	(0.037)	(0.037)	(0.037)	(0.037)	(0.037)	(0.036)	(0.036)	(0.036)
Corrr	0.005	−0.003	−0.000	−0.004	−0.003	0.001	−0.002	0.004	0.005	0.004
	(0.037)	(0.039)	(0.039)	(0.039)	(0.039)	(0.038)	(0.039)	(0.037)	(0.037)	(0.037)
Trade	−0.016	−0.021*	−0.021	−0.023*	−0.020	−0.021	−0.023*	−0.017	−0.016	−0.016
	(0.012)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.012)	(0.012)	(0.012)
NetMigL1			0.082							
			(0.057)							
NetMigL2				0.100*						
				(0.054)						
NetInFlow					−0.062					
					(0.071)					
NetInMigL1						0.155**				
						(0.070)				
NetInMigL2							0.118*			
							(0.068)			
NetOutFlow								−0.273**		
								(0.120)		
NetOutMigL1									−0.088	
									(0.117)	
NetOutMigL2										0.102
										(0.112)
Observations	815	779	779	779	779	779	779	815	815	815
R-squared	0.842	0.840	0.840	0.840	0.839	0.840	0.840	0.843	0.842	0.842
Number of id	102	97	97	97	97	97	97	102	102	102
State FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

[a] Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
[b] Fert represents a lag of 2 for log(Fertility), GDPperCap represents Log(GDP per Capita), Mig is the net migration share of the population, Agri is the log(Agricultural Value Added), GFCF refers to gross fixed capital formation, Corr is the absence of corruption, and trade is the share of trade in terms of GDP.
[c] endings L1 represents a lag of 1 period of a variable standing before it and L2 the lag of 2 periods.

Table A.2
Complete results for all countries using HCI as a dependent variable for countries experiencing depopulation.

VARIABLES	(1) No Mig	(2) Mig	(3) Net Mig L1	(4) Net Mig L2	(5) Net In Mig	(6) Net In Mig L1	(7) Net In Mig L2	(8) Net Out Mig	(9) Net Out Mig L1	(10) Net Out Mig L2
Fert	−0.082***	−0.054**	−0.061**	−0.065**	−0.056**	−0.063**	−0.068**	−0.072***	−0.077***	−0.081***
	(0.025)	(0.025)	(0.027)	(0.026)	(0.027)	(0.027)	(0.026)	(0.024)	(0.025)	(0.025)
GDPperCap	0.006	0.007	0.008	0.006	0.005	0.006	0.006	0.008	0.009	0.006
	(0.011)	(0.010)	(0.011)	(0.010)	(0.010)	(0.011)	(0.011)	(0.010)	(0.011)	(0.010)
Mig		−0.557***								
		(0.159)								
Agri	−0.094	−0.120	−0.086	−0.093	−0.081	−0.086	−0.091	−0.137*	−0.093	−0.098
	(0.081)	(0.077)	(0.080)	(0.080)	(0.080)	(0.081)	(0.080)	(0.077)	(0.080)	(0.080)
GFCF	0.098	0.151**	0.136**	0.134**	0.151**	0.129**	0.129**	0.114*	0.109*	0.102*
	(0.061)	(0.060)	(0.062)	(0.062)	(0.063)	(0.063)	(0.062)	(0.058)	(0.061)	(0.061)
Corr	0.010	−0.004	0.024	−0.016	−0.003	0.006	0.012	0.002	0.031	−0.011
	(0.055)	(0.053)	(0.056)	(0.056)	(0.055)	(0.055)	(0.055)	(0.052)	(0.056)	(0.057)
Trade	−0.011	−0.007	0.015	0.024	0.019	0.021	0.019	−0.036*	−0.017	−0.009
	(0.020)	(0.023)	(0.023)	(0.022)	(0.022)	(0.023)	(0.023)	(0.020)	(0.020)	(0.020)
NetMigL1			−0.234							
			(0.153)							
NetMigL2				0.237*						
				(0.136)						
NetInFlow					−0.803**					
					(0.403)					
NetInMig1						−0.292				
						(0.419)				
NetInMigL2							0.597			
							(0.421)			
NetOutFlow								−0.669***		
								(0.183)		
NetOutMigL1									−0.286	
									(0.175)	
NetOutMigL2										0.213
										(0.158)

(*continued on next page*)

Table A.2 (*continued*).

VARIABLES	(1) No Mig	(2) Mig	(3) Net Mig L1	(4) Net Mig L2	(5) Net In Mig	(6) Net In Mig L1	(7) Net In Mig L2	(8) Net Out Mig	(9) Net Out Mig L1	(10) Net Out Mig L2
Observations	153	142	142	142	142	142	142	153	153	153
R-squared	0.914	0.927	0.921	0.921	0.922	0.919	0.920	0.923	0.916	0.916
Number of id	22	20	20	20	20	20	20	22	22	22
State FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

[a] Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
[b] Fert represents a lag of 2 for log(Fertility), GDPperCap represents Log(GDP per Capita), Mig is the net migration share of the population, Agri is the log(Agricultural Value Added), GFCF refers to gross fixed capital formation, Corr is the absence of corruption, and trade is the share of trade in terms of GDP.
[c] For variables Q1-Q4 see Table 1, fertCat is a categorical variable of fertility levels, OutMig is the depiction of net out-migration, where positive values take values of zero and the exact opposite goes for InMig, which encompasses positive values only and zero otherwise.
[d] columns (10)–(18) are regressions corresponding to the sub-sample of countries which are experiencing population decline
[e] L1 represents a lag of 1 period of a variable standing before it and L2 the lag of 2 periods.

Table A.3
Results for all countries using HCS1 as a dependent variable.

VARIABLES	(1) No Mig	(2) Mig	(3) Net Mig L1	(4) Net Mig L2	(5) Net In Mig	(6) Net In Mig L1	(7) Net In Mig L2	(8) Net Out Mig	(9) Net Out Mig L1	(10) Net Out Mig L2
Fert	−0.082***	−0.084***	−0.084***	−0.083***	−0.084***	−0.083***	−0.083***	−0.082***	−0.083***	−0.082***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
GDPperCap	0.021***	0.021***	0.019***	0.021***	0.021***	0.020***	0.021***	0.022***	0.021***	0.021***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Mig		−0.017								
		(0.044)								
Agri	−0.019	−0.014	−0.024	−0.015	−0.015	−0.026	−0.015	−0.023	−0.020	−0.020
	(0.050)	(0.051)	(0.051)	(0.052)	(0.052)	(0.051)	(0.052)	(0.051)	(0.050)	(0.050)
GFCF	−0.148***	−0.151***	−0.153***	−0.152***	−0.151***	−0.153***	−0.152***	−0.151***	−0.149***	−0.148***
	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)
Corr	0.069**	0.061*	0.062**	0.061*	0.061*	0.063**	0.061*	0.069**	0.069**	0.069**
	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)
Trade	0.022**	0.026**	0.026**	0.026**	0.026**	0.026**	0.026**	0.021**	0.022**	0.022**
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
NetMigL1			0.101**							
			(0.044)							
NetMigL2				−0.013						
				(0.051)						
NetInFlow					0.008					
					(0.055)					
NetInMigL1						0.129**				
						(0.053)				
NetInMigL2							−0.018			
							(0.073)			
NetOutFlow								−0.103		
								(0.092)		
NetOutMigL1									0.071	
									(0.092)	
NetOutMigL2										−0.007
										(0.087)
Observations	693	662	662	662	662	662	662	693	693	693
R-squared	0.871	0.871	0.872	0.871	0.871	0.872	0.871	0.872	0.872	0.871
Number of id	98	93	93	93	93	93	93	98	98	98
State FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

[a] Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
[b] Fert represents a lag of 2 for log(Fertility), GDPperCap represents Log(GDP per Capita), Mig is the net migration share of the population, Agri is the log(Agricultural Value Added), GFCF refers to gross fixed capital formation, Corr is the absence of corruption, and trade is the share of trade in terms of GDP.
[c] For variables Q1-Q4 see Table 1, OutMig is the depiction of net out-migration, where positive values take values of zero and the exact opposite goes for InMig, which encompasses positive values only and zero otherwise.
[d] columns (10)–(18) are regressions corresponding to the sub-sample of countries which are experiencing population decline
[e] L1 represents a lag of 1 period of a variable standing before it and L2 the lag of 2 periods.

Table A.4
Results for all countries using HCS2 as a dependent variable.

VARIABLES	(1) No Mig	(2) Mig	(3) Net Mig L1	(4) Net Mig L2	(5) Net In Mig	(6) Net In Mig L1	(7) Net In Mig L2	(8) Net Out Mig	(9) Net Out Mig L1	(10) Net Out Mig L2
Fert	−0.080***	−0.081***	−0.082***	−0.080***	−0.081***	−0.081***	−0.080***	−0.080***	−0.081***	−0.080***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
GDPperCap	0.033***	0.033***	0.031***	0.032***	0.032***	0.031***	0.032***	0.034***	0.032***	0.033***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Mig		−0.023								
		(0.049)								
Agri	0.031	0.041	0.031	0.038	0.040	0.029	0.038	0.027	0.031	0.031

(*continued on next page*)

Table A.4 (*continued*).

VARIABLES	(1) No Mig	(2) Mig	(3) Net Mig L1	(4) Net Mig L2	(5) Net In Mig	(6) Net In Mig L1	(7) Net In Mig L2	(8) Net Out Mig	(9) Net Out Mig L1	(10) Net Out Mig L2
	(0.055)	(0.056)	(0.056)	(0.056)	(0.056)	(0.056)	(0.056)	(0.055)	(0.055)	(0.055)
GFCF	−0.195***	−0.198***	−0.200***	−0.200***	−0.198***	−0.200***	−0.200***	−0.198***	−0.196***	−0.195***
	(0.036)	(0.036)	(0.036)	(0.037)	(0.036)	(0.036)	(0.037)	(0.036)	(0.036)	(0.036)
Corr	0.081**	0.076**	0.077**	0.077**	0.076**	0.078**	0.076**	0.081**	0.081**	0.082**
	(0.033)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.033)	(0.033)	(0.033)
Trade	0.037***	0.041***	0.041***	0.042***	0.041***	0.042***	0.042***	0.036***	0.037***	0.037***
	(0.012)	(0.012)	(0.012)	(0.013)	(0.012)	(0.012)	(0.013)	(0.012)	(0.012)	(0.012)
NetMigL1			0.099**							
			(0.048)							
NetMigL2				−0.026						
				(0.056)						
NetInFlow					0.004					
					(0.060)					
NetInMigL1						0.121**				
						(0.058)				
NetInMigL2							−0.041			
							(0.080)			
NetOutFlow								−0.115		
								(0.101)		
NetOutMigL1									0.083	
									(0.101)	
NetOutMigL2										−0.010
										(0.095)
Observations	693	662	662	662	662	662	662	693	693	693
R-squared	0.871	0.871	0.871	0.871	0.870	0.871	0.871	0.871	0.871	0.871
Number of id	98	93	93	93	93	93	93	98	98	98
State FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

[a] Standard errors in parentheses, $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.
[b] Fert represents a lag of 2 for log(Fertility), GDPperCap represents Log(GDP per Capita), Mig is the net migration share of the population, Agri is the log(Agricultural Value Added), GFCF refers to gross fixed capital formation, Corr is the absence of corruption, and trade is the share of trade in terms of GDP.
[c] For variables Q1-Q4 see Table 1, fertCat is a categorical variable of fertility levels, OutMig is the depiction of net out-migration, where positive values take values of zero and the exact opposite goes for InMig, which encompasses positive values only and zero otherwise.
[d] columns (10)–(18) are regressions corresponding to the sub-sample of countries which are experiencing population decline
[e] L1 represents a lag of 1 period of a variable standing before it and L2 the lag of 2 periods.

Table A.5
Results for all countries using HCS3 as a dependent variable.

VARIABLES	(1) No Mig	(2) Mig	(3) Net Mig L1	(4) Net Mig L2	(5) Net In Mig	(6) Net In Mig L1	(7) Net In Mig L2	(8) Net Out Mig	(9) Net Out Mig L1	(10) Net Out Mig L2
Fert	−0.082***	−0.083***	−0.084***	−0.083***	−0.083***	−0.083***	−0.083***	−0.082***	−0.082***	−0.082***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
GDPperCap	0.021***	0.021***	0.019***	0.021***	0.021***	0.020***	0.021***	0.022***	0.021***	0.021***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Mig		−0.019								
		(0.045)								
Agri Share	−0.016	−0.011	−0.021	−0.012	−0.012	−0.023	−0.012	−0.021	−0.016	−0.017
	(0.050)	(0.052)	(0.051)	(0.052)	(0.052)	(0.051)	(0.052)	(0.051)	(0.051)	(0.051)
GFCF	−0.150***	−0.152***	−0.155***	−0.153***	−0.153***	−0.155***	−0.153***	−0.152***	−0.150***	−0.150***
	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.034)	(0.033)	(0.033)	(0.033)
Corr	0.068**	0.059*	0.061*	0.060*	0.059*	0.062**	0.059*	0.068**	0.067**	0.068**
	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)
Trade	0.022**	0.026**	0.026**	0.026**	0.026**	0.026**	0.026**	0.021*	0.022**	0.022**
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
NetMigL1			0.100**							
			(0.044)							
NetMigL2				−0.013						
				(0.051)						
NetInFlow					0.009					
					(0.055)					
NetInMigL1						0.130**				
						(0.053)				
NetInMigL2							−0.018			
							(0.073)			
NetOutFlow								−0.114		
								(0.092)		
NetOutMigL1									0.064	
									(0.092)	
NetOutMigL2										−0.007
										(0.087)
Observations	693	662	662	662	662	662	662	693	693	693

(*continued on next page*)

Table A.5 (*continued*).

VARIABLES	(1) No Mig	(2) Mig	(3) Net Mig L1	(4) Net Mig L2	(5) Net In Mig	(6) Net In Mig L1	(7) Net In Mig L2	(8) Net Out Mig	(9) Net Out Mig L1	(10) Net Out Mig L2
R-squared	0.869	0.868	0.869	0.868	0.868	0.870	0.868	0.869	0.869	0.869
Number of id	98	93	93	93	93	93	93	98	98	98
State FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

[a] Standard errors in parentheses, $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.
[b] Fert represents a lag of 2 for log(Fertility), GDPperCap represents Log(GDP per Capita), Mig is the net migration share of the population, Agri is the log(Agricultural Value Added), GFCF refers to gross fixed capital formation, Corr is the absence of corruption, and trade is the share of trade in terms of GDP.
[c] For variables Q1-Q4 see Table 1, fertCat is a categorical variable of fertility levels, OutMig is the depiction of net out-migration, where positive values take values of zero and the exact opposite goes for InMig, which encompasses positive values only and zero otherwise.
[d] columns (10)–(18) are regressions corresponding to the sub-sample of countries which are experiencing population decline
[e] L1 represents a lag of 1 period of a variable standing before it and L2 the lag of 2 periods.

Table A.6
Results for all countries using HCS4 as a dependent variable.

VARIABLES	(1) No Mig	(2) Mig	(3) Net Mig L1	(4) Net Mig L2	(5) Net In Mig	(6) Net In Mig L1	(7) Net In Mig L2	(8) Net Out Mig	(9) Net Out Mig L1	(10) Net Out Mig L2
Fert	−0.080***	−0.081***	−0.081***	−0.080***	−0.081***	−0.081***	−0.080***	−0.080***	−0.080***	−0.080***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
GDPperCap	0.033***	0.033***	0.031***	0.032***	0.032***	0.031***	0.032***	0.034***	0.032***	0.033***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Mig		−0.025								
		(0.049)								
Agri	0.034	0.044	0.034	0.041	0.042	0.031	0.041	0.029	0.034	0.034
	(0.055)	(0.056)	(0.056)	(0.056)	(0.057)	(0.056)	(0.056)	(0.055)	(0.055)	(0.055)
GFCF	−0.197***	−0.199***	−0.202***	−0.201***	−0.199***	−0.201***	−0.201***	−0.199***	−0.197***	−0.197***
	(0.036)	(0.036)	(0.036)	(0.037)	(0.036)	(0.036)	(0.037)	(0.036)	(0.036)	(0.036)
Corr	0.080**	0.074**	0.076**	0.075**	0.075**	0.077**	0.075**	0.080**	0.080**	0.080**
	(0.033)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.033)	(0.033)	(0.034)
Trade	0.037***	0.041***	0.041***	0.042***	0.041***	0.042***	0.042***	0.036***	0.037***	0.037***
	(0.012)	(0.012)	(0.012)	(0.013)	(0.012)	(0.012)	(0.013)	(0.012)	(0.012)	(0.012)
NetMigL1			0.098**							
			(0.048)							
NetMigL2				−0.026						
				(0.056)						
NetInFlow					0.005					
					(0.060)					
NetInMigL1						0.122**				
						(0.059)				
NetInMigL2							−0.040			
							(0.080)			
NetOutFlow								−0.125		
								(0.101)		
NetOutMigL1									0.076	
									(0.101)	
NetOutMigL2										−0.011
										(0.095)
Observations	693	662	662	662	662	662	662	693	693	693
R-squared	0.869	0.868	0.869	0.868	0.868	0.869	0.868	0.869	0.869	0.869
Number of id	98	93	93	93	93	93	93	98	98	98
State FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard errors in parentheses
$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

[a] Standard errors in parentheses, $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.
[b] Fert represents a lag of 2 for log(Fertility), GDPperCap represents Log(GDP per Capita), Mig is the net migration share of the population, Agri is the log(Agricultural Value Added), GFCF refers to gross fixed capital formation, Corr is the absence of corruption, and trade is the share of trade in terms of GDP.
[c] For variables Q1-Q4 see Table 1, fertCat is a categorical variable of fertility levels, OutMig is the depiction of net out-migration, where positive values take values of zero and the exact opposite goes for InMig, which encompasses positive values only and zero otherwise.
[d] columns (10)–(18) are regressions corresponding to the sub-sample of countries which are experiencing population decline
[e] L1 represents a lag of 1 period of a variable standing before it and L2 the lag of 2 periods.

Table A.7
Results for all countries using HCS1 as a dependent variable for depopulation countries.

VARIABLES	(1) No Mig	(2) Mig	(3) Net Mig L1	(4) Net Mig L2	(5) Net In Mig	(6) Net In Mig L1	(7) Net In Mig L2	(8) Net Out Mig	(9) Net Out Mig L1	(10) Net Out Mig L2
Fert	0.031	0.051*	0.044	0.041	0.044	0.044	0.044	0.043	0.028	0.029
	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)	(0.028)	(0.029)	(0.029)	(0.029)	(0.029)
GDPperCap	0.012	0.010	0.009	0.010	0.010	0.012	0.009	0.014	0.010	0.012
	(0.013)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)	(0.012)
Net Mig Share		−0.209								
		(0.177)								
Agri	−0.022	−0.026	−0.010	−0.006	−0.009	0.003	−0.008	−0.058	−0.022	−0.019

(*continued on next page*)

Table A.7 (*continued*).

VARIABLES	(1) No Mig	(2) Mig	(3) Net Mig L1	(4) Net Mig L2	(5) Net In Mig	(6) Net In Mig L1	(7) Net In Mig L2	(8) Net Out Mig	(9) Net Out Mig L1	(10) Net Out Mig L2
	(0.086)	(0.083)	(0.083)	(0.082)	(0.083)	(0.081)	(0.083)	(0.086)	(0.086)	(0.085)
GFCF	0.059	0.094	0.079	0.063	0.081	0.081	0.074	0.079	0.052	0.047
	(0.068)	(0.067)	(0.067)	(0.067)	(0.068)	(0.065)	(0.067)	(0.067)	(0.068)	(0.068)
Corr	0.123**	0.098*	0.098*	0.120**	0.100*	0.106*	0.097*	0.122**	0.109*	0.146**
	(0.059)	(0.056)	(0.059)	(0.058)	(0.057)	(0.055)	(0.057)	(0.058)	(0.061)	(0.061)
Trade	0.055**	0.080***	0.093***	0.092***	0.092***	0.092***	0.094***	0.036	0.057**	0.055**
	(0.024)	(0.027)	(0.026)	(0.025)	(0.026)	(0.025)	(0.026)	(0.025)	(0.024)	(0.023)
NetMigL1			0.026							
			(0.161)							
NetMigL2				−0.196						
				(0.141)						
NetInFlow					−0.041					
					(0.429)					
NetInMigL1						−0.968**				
						(0.437)				
NetInMigL2							−0.344			
							(0.450)			
NetOutFlow								−0.426**		
								(0.213)		
NetOutMigL1									0.159	
									(0.190)	
NetOutMigL2										−0.217
										(0.168)
Observations	131	122	122	122	122	122	122	131	131	131
R-squared	0.938	0.947	0.946	0.947	0.946	0.949	0.946	0.940	0.938	0.939
Number of id	22	20	20	20	20	20	20	22	22	22
State FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

[a] Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

[b] Fert represents a lag of 2 for log(Fertility), GDPperCap represents Log(GDP per Capita), Mig is the net migration share of the population, Agri is the log(Agricultural Value Added), GFCF refers to gross fixed capital formation, Corr is the absence of corruption, and trade is the share of trade in terms of GDP.

[c] For variables Q1-Q4 see Table 1, fertCat is a categorical variable of fertility levels, OutMig is the depiction of net out-migration, where positive values take values of zero and the exact opposite goes for InMig, which encompasses positive values only and zero otherwise.

[d] columns (10)–(18) are regressions corresponding to the sub-sample of countries which are experiencing population decline

[e] L1 represents a lag of 1 period of a variable standing before it and L2 the lag of 2 periods.

Table A.8
Results for all countries using HCS2 as a dependent variable for depopulation countries.

VARIABLES	(1) No Mig	(2) Mig	(3) Net Mig L1	(4) Net Mig L2	(5) Net In Mig	(6) Net In Mig L1	(7) Net In Mig L2	(8) Net Out Mig	(9) Net Out Mig L1	(10) Net Out Mig L2
Fert	0.039	0.055	0.050	0.048	0.050	0.052	0.052	0.049	0.034	0.036
	(0.035)	(0.036)	(0.036)	(0.035)	(0.036)	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)
GDPperCap	0.017	0.016	0.014	0.015	0.016	0.017	0.014	0.019	0.014	0.018
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Mig		−0.086								
		(0.217)								
Agri	0.001	0.010	0.016	0.022	0.012	0.028	0.019	−0.029	0.002	0.007
	(0.103)	(0.102)	(0.101)	(0.099)	(0.101)	(0.100)	(0.101)	(0.105)	(0.103)	(0.102)
GFCF	−0.036	−0.011	−0.021	−0.043	−0.026	−0.015	−0.025	−0.020	−0.048	−0.055
	(0.081)	(0.083)	(0.082)	(0.081)	(0.083)	(0.080)	(0.081)	(0.082)	(0.082)	(0.082)
Corr	0.180**	0.155**	0.146**	0.187***	0.159**	0.162**	0.152**	0.179**	0.159**	0.215***
	(0.070)	(0.069)	(0.071)	(0.070)	(0.069)	(0.068)	(0.069)	(0.070)	(0.073)	(0.073)
Trade	0.073**	0.109***	0.116***	0.114***	0.115***	0.114***	0.117***	0.057*	0.076***	0.073**
	(0.028)	(0.034)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.030)	(0.028)	(0.028)
NetMigL1			0.102							
			(0.196)							
NetMigL2				−0.301*						
				(0.171)						
NetInFlow					0.297					
					(0.522)					
NetInMigL1						−0.925*				
						(0.538)				
NetInMigL2							−0.523			
							(0.548)			
NetOutFlow								−0.358		
								(0.259)		
NetOutMigL1									0.248	
									(0.228)	
NetOutMigL2										−0.327
										(0.201)
Observations	131	122	122	122	122	122	122	131	131	131
R-squared	0.931	0.938	0.938	0.940	0.938	0.940	0.939	0.932	0.932	0.933

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Table A.8 (*continued*).

VARIABLES	(1) No Mig	(2) Mig	(3) Net Mig L1	(4) Net Mig L2	(5) Net In Mig	(6) Net In Mig L1	(7) Net In Mig L2	(8) Net Out Mig	(9) Net Out Mig L1	(10) Net Out Mig L2
Number of id	22	20	20	20	20	20	20	22	22	22
State FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

[a] Standard errors in parentheses, $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.
[b] Fert represents a lag of 2 for log(Fertility), GDPperCap represents Log(GDP per Capita), Mig is the net migration share of the population, Agri is the log(Agricultural Value Added), GFCF refers to gross fixed capital formation, Corr is the absence of corruption, and trade is the share of trade in terms of GDP.
[c] For variables Q1-Q4 see Table 1, fertCat is a categorical variable of fertility levels, OutMig is the depiction of net out-migration, where positive values take values of zero and the exact opposite goes for InMig, which encompasses positive values only and zero otherwise.
[d] columns (10)–(18) are regressions corresponding to the sub-sample of countries which are experiencing population decline
[e] L1 represents a lag of 1 period of a variable standing before it and L2 the lag of 2 periods.

Table A.9
Results for all countries using HCS3 as a dependent variable for depopulation countries.

VARIABLES	(1) No Mig	(2) Mig	(3) Net Mig L1	(4) Net Mig L2	(5) Net In Mig	(6) Net In Mig L1	(7) Net In Mig L2	(8) Net Out Mig	(9) Net Out Mig L1	(10) Net Out Mig L2
Fert	0.031	0.051*	0.044	0.041	0.044	0.045	0.044	0.043	0.028	0.029
	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)	(0.028)	(0.029)	(0.029)	(0.029)	(0.029)
GDPperCap	0.011	0.010	0.009	0.009	0.009	0.011	0.008	0.013	0.009	0.012
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)	(0.012)
Mig		−0.212								
		(0.177)								
Agri	−0.021	−0.025	−0.009	−0.005	−0.008	0.004	−0.007	−0.058	−0.021	−0.018
	(0.085)	(0.083)	(0.083)	(0.082)	(0.083)	(0.081)	(0.083)	(0.086)	(0.086)	(0.085)
GFCF	0.060	0.095	0.079	0.063	0.081	0.082	0.075	0.079	0.052	0.047
	(0.068)	(0.067)	(0.067)	(0.067)	(0.068)	(0.065)	(0.067)	(0.067)	(0.068)	(0.068)
Corr	0.123**	0.099*	0.099*	0.121**	0.100*	0.107*	0.098*	0.123**	0.110*	0.147**
	(0.058)	(0.056)	(0.059)	(0.058)	(0.057)	(0.055)	(0.057)	(0.058)	(0.061)	(0.061)
Trade	0.055**	0.080***	0.092***	0.092***	0.092***	0.092***	0.094***	0.036	0.057**	0.055**
	(0.024)	(0.027)	(0.026)	(0.025)	(0.026)	(0.025)	(0.026)	(0.025)	(0.024)	(0.023)
NetMigL1			0.024							
			(0.161)							
NetMigL2				−0.197						
				(0.141)						
NetInFlow					−0.049					
					(0.429)					
NetInMigL1						−0.977**				
						(0.436)				
NetInMigL2							−0.350			
							(0.450)			
NetOutFlow								−0.427**		
								(0.213)		
NetOutMigL1									0.158	
									(0.190)	
NetOutMigL2										−0.217
										(0.168)
Observations	131	122	122	122	122	122	122	131	131	131
R-squared	0.937	0.946	0.945	0.946	0.945	0.948	0.945	0.939	0.937	0.938
Number of id	22	20	20	20	20	20	20	22	22	22
State FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

[a] Standard errors in parentheses, $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.
[b] Fert represents a lag of 2 for log(Fertility), GDPperCap represents Log(GDP per Capita), Mig is the net migration share of the population, Agri is the log(Agricultural Value Added), GFCF refers to gross fixed capital formation, Corr is the absence of corruption, and trade is the share of trade in terms of GDP.
[c] For variables Q1-Q4 see Table 1, fertCat is a categorical variable of fertility levels, OutMig is the depiction of net out-migration, where positive values take values of zero and the exact opposite goes for InMig, which encompasses positive values only and zero otherwise.
[d] columns (10)–(18) are regressions corresponding to the sub-sample of countries which are experiencing population decline
[e] L1 represents a lag of 1 period of a variable standing before it and L2 the lag of 2 periods.

Table A.10
Results for all countries using HCS4 as a dependent variable for depopulation countries.

VARIABLES	(1) No Mig	(2) Mig	(3) Net Mig L1	(4) Net Mig L2	(5) Net In Mig	(6) Net In Mig L1	(7) Net In Mig L2	(8) Net Out Mig	(9) Net Out Mig L1	(10) Net Out Mig L2
Fert	0.040	0.055	0.050	0.048	0.050	0.052	0.052	0.049	0.034	0.036
	(0.035)	(0.036)	(0.036)	(0.035)	(0.036)	(0.035)	(0.035)	(0.035)	(0.035)	(0.034)
GDPperCap	0.017	0.015	0.013	0.015	0.015	0.017	0.013	0.019	0.014	0.017
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Mig		−0.089								
		(0.217)								
Agri	0.002	0.010	0.017	0.023	0.013	0.029	0.020	−0.028	0.003	0.008
	(0.103)	(0.102)	(0.101)	(0.099)	(0.101)	(0.100)	(0.100)	(0.105)	(0.103)	(0.102)
GFCF	−0.035	−0.011	−0.021	−0.042	−0.025	−0.015	−0.025	−0.019	−0.048	−0.055

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Table A.10 (*continued*).

VARIABLES	(1) No Mig	(2) Mig	(3) Net Mig L1	(4) Net Mig L2	(5) Net In Mig	(6) Net In Mig L1	(7) Net In Mig L2	(8) Net Out Mig	(9) Net Out Mig L1	(10) Net Out Mig L2
	(0.081)	(0.083)	(0.082)	(0.081)	(0.083)	(0.080)	(0.081)	(0.082)	(0.082)	(0.082)
Corr	0.180**	0.156**	0.148**	0.188***	0.160**	0.163**	0.153**	0.180**	0.160**	0.215***
	(0.070)	(0.069)	(0.071)	(0.070)	(0.069)	(0.068)	(0.069)	(0.070)	(0.073)	(0.073)
Trade	0.072**	0.108***	0.116***	0.114***	0.114***	0.114***	0.116***	0.056*	0.076***	0.073**
	(0.028)	(0.034)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.030)	(0.028)	(0.028)
NetMigL1			0.100							
			(0.196)							
NetMigL2				−0.302*						
				(0.171)						
NetInFlow					0.289					
					(0.522)					
NetInMigL1						−0.935*				
						(0.538)				
NetInMigL2							−0.529			
							(0.548)			
NetOutFlow								−0.359		
								(0.259)		
NetOutMigL1									0.247	
									(0.228)	
NetOutMigL2										−0.327
										(0.201)
Observations	131	122	122	122	122	122	122	131	131	131
R-squared	0.930	0.937	0.938	0.939	0.938	0.939	0.938	0.931	0.931	0.932
Number of id	22	20	20	20	20	20	20	22	22	22
State FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

[a] Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
[b] Fert represents a lag of 2 for log(Fertility), GDPperCap represents Log(GDP per Capita), Mig is the net migration share of the population, Agri is the log(Agricultural Value Added), GFCF refers to gross fixed capital formation, Corr is the absence of corruption, and trade is the share of trade in terms of GDP.
[c] For variables Q1-Q4 see Table 1, fertCat is a categorical variable of fertility levels, OutMig is the depiction of net out-migration, where positive values take values of zero and the exact opposite goes for InMig, which encompasses positive values only and zero otherwise.
[d] columns (10)–(18) are regressions corresponding to the sub-sample of countries which are experiencing population decline
[e] L1 represents a lag of 1 period of a variable standing before it and L2 the lag of 2 periods.

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