Labour Migration:
Who Loses, Who Benefits in the Country of Origin? -
Evidence from Romania

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The Impact of Parental Labor Migration on Left-Behind Children's Educational and Psychosocial Outcomes
Evidence from Romania

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Outline

Low-skilled migration

High-skilled migration

Motivation and contribution

Dorul de mama curma vieti: Val de sinucider in randul copiilor romani care au parintii plecati in Italia

de **Ionela Samoila**   Vineri, 09 Mai 2014, ora 22:

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Tweet

Nu mai putin de 40 de copii ai imigrantilor romani din Italia s-au sinucis din 2008 si pana in prezent.

Potrivit unei statistici citate de Rai News, principala cauza a sinuciderilor infantile in randu copiilor ramasi in tara este dorul de mama.

750.000 din 5 milioane de copii romani au cel putin un parinte care lucreaza peste hotare, iar 80% dintre acestia ajung sa sufere de dorul lor si sa intre in depresie.

In 75% dintre cazuri, copiii raman in tara cu tatal, cu bunicii sau cu alte rude, in vreme ce mamele lor ajunga sa lucreze in Italia ca ingrijitoare, bone sau menajere.

Acasa raman copiii numiti in statistici "orfanii albi", iar mamele lor ajung, la randul lor, sa sufere de "sindromul Italiei", o forma acuta de depresie intalnita la romancele din strainatate.

Sute de mii de copii romani, abandonati de parintii plecati in strainatate

Aproximativ 350.000 de copii din Romania traiesc fara unul sau ambii

Motivation and contribution

Over the past two decades, increasingly more Romanian parents migrated abroad for employment, while their children remained at home.

This experience in the child's life could have important short- and long-term consequences:

> On the one hand, parents get better paid jobs abroad, providing their children with more financial and educational resources.

> On the other hand, absence of the adult caregiver may have a negative impact on children's health and mental well-being.

This paper is the first to examine the *causal effects* of parents' migration on their children left home in Romania.

This paper's contribution to the literature

We provide causal estimates of the impact of parental migration on the mental health of children left-behind.

Our study adopts a more children-inclusive approach.

First study conducted in a country from Eastern Europe.

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Some statistical facts

Numbers of Romanian emigrants

In 2015/16, Romania had an estimated 3.4 million emigrants aged 15 and above, and was among the five OECD countries with the largest group of emigrants. (*Source: DIOC database, 2015/16*).

Romania occupied the first place in the ranking of emigration rates (17%) for main origin countries of emigrants in the OECD area. (*Source: DIOC database, 2015/16*).

Data on the Romanian children left behind

- 2007: 170 000 junior high school students (over 16 percent of students enrolled in high school) had parents working outside Romania (*Toth et al., 2007*).

- 2008: almost 350 000 children (from a total of 4.400.000 children aged 0-18) lived in migrant families (*Unicef, Toth et al., 2008*).

- Official data: grossly underestimated

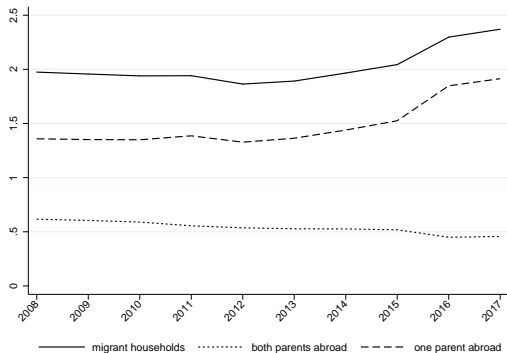# Data on the Romanian children left behind

Figure: Proportion of Romanian children (0 to 18 years) living in migrant households

Source: Romanian Authority for Child Protection and The National Institute of Statistics, Romania

Related literature

New Economics of Labor Migration that perceives emigration as a contractual arrangement between migrants and their family (Stark & Bloom, 1985).

- - positive effects on educational attainment and school attendance (Yang, 2008; Alcaraz *et al.*, 2012; Bennett *et al.*, 2013)
- - parental migration improves children's health and nutrition (Mu & De Braw, 2015; Carletto *et al.* 2011)

Studies that examine the disruptive effects of migration on left-behind household members.

- - left-behind children neglect study and participate less in school (Amuedo-Dorantes & Poze, 2010; McKenzie & Rapoport, 2011)
- - parents' absence due to migration affect their children's physical health (Nguyen, 2016; Lei *et al.*, 2018; Xu *et al*, 2018)
- - children left-behind are more prone to depression, anxiety and other emotional and mental health problems (Li *et al.*, 2009)

Literature on children's agency in determining migration outcomes (Asis, 2006; Bushin, 2009; Lam &Leoh, 2018)

- - childrens agency increases more after parental migration (Dreby, 2007)

Data

- 3 Sources of data:

- a survey carried out in 2007 by the Romanian branch of *Gallup International* within a project financed by the *Soros Foundation*.

- the Romanian population and housing census from March 2002

- a community census on temporary migration carried out in December 2001

We restrict our sample to those children:

- whose parents have been working abroad for at least 12 months (and not less)

- living in intact families

We end up with a sample of 1421 cases (high-school students).
279 children (almost 20 percent) with at least one parent abroad.

Estimation technique

$$Outcome_i = \alpha + \beta \times Migration_i + \gamma^{'} X_i + \epsilon_i$$

where

- *Outcome$_i$* includes measures for school performance, childs health and mental well-being.

- *Migration$_i$* - Dummy (1 if at least one parent abroad)

- *X$_i$* includes age, grade, parents education (proxy for household wealth and socio-economic status), dummies for urban communities and for regions.

Outcome variables

For school performance: we use students' self-reported GPA for the last semester (fall semester of the school year 2006-2007), as well as the expected GPA for the entire 2006 - 2007 school year.

For the physical health status: the variable *having any illness* that was assessed based on the child's self reporting as being ill *often or pretty often* in the five months prior to the survey.

For the mental well-being: *being depressed* (child reports on feeling alone, not loved, neglected, afraid, worried or unhappy), *being bullied* (being insulted, scared, being laughed at) in the last five months prior to survey.

Identification

Endogeneity of migration:
Non-random selection of households into migration: migrant and nonmigrant families are likely to differ in unobservable factors that may also affect the children outcomes (Antman, 2013).

To control for the potential endogeneity of migration: *Instrumental variable approach*

- *Instrument*: the proportion of Romanian migrants in a community (village, town, city) measured in 2001/2002.

$$Migrant_i = \theta + \delta Z_i + \phi^{'} X_i + \upsilon_i$$

Our identifying assumption:
the share of migrants in 2001/2002 does not directly affect either school performance nor children's well-being 5-6 years later.

Possible threats to its validity

1. First, it is likely that household's decision to migrate in 2007 does not
differ from their decision to migrate 5 years prior
$\implies$
we also consider an index for the assessment of the county development - *Devjud98*
(which is correlated with the instrument)

2. Certain regions (due to short distances or economic conditions)
systematically send more people abroad.
$\implies$ we include region dummies

The relevance of our excluded instrumental variable

1. The F-statistics on excluded instrument exceeds in all cases the Staiger and Stock (1997) *rule-of-thumb* criteria of 10 for the instrument to be declared weak.

2. The instrument is highly significant in all linear probability models from the first stage regressions (positive impact).

3. Without controlling for the county's development: similar results.

Table: Effects of having parents working abroad on school achievement

GPA from last semester			
	OLS	2SLS§	First stage coefficient for IV
(1) Individual characteristics only	-0.16^{**} (0.08)	1.21 (0.92)	0.02^{***} (0.01)
F-statistic (1st stage)			13.11
(2) Add parents's education to (1)	-0.14^{*} (0.08)	1.54^{*} (0.91)	0.02^{***} (0.01)
F-statistic (1st stage)			9.44
(3) Add regional characteristics to (2)	-0.12 (0.08)	2.40^{**} (1.01)	0.02^{***} (0.01)
F-statistic (1st stage)			10.35

Notes: The table reports estimates for two approaches (OLS and 2SLS - 2nd and 1st stages) on the effect of having parents abroad on school achievement.

Individual characteristics include gender and age.

The education levels of each parent are classified into three categories: primary school, secondary education, and tertiary education.

Region characteristics include region fixed effects (indicators for 4 regions) and the index of county development (*Devjud98*).

§ Second-stage coefficient from two-stage least squares using instrumental variables for having parents working abroad.

Standard errors in parentheses are simulated with 200 bootstrap replications and clustered at the community level. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table: Effects of having parents working abroad on school achievement

Expected yearly GPA			
	OLS	2SLS§	First stage coefficient for IV
(1) Individual characteristics only	-0.17^{**} (0.07)	0.92 (0.82)	0.02^{***} (0.01)
F-statistic (1st stage)			12.54
(2) Add parents's education to (1)	-0.15^{**} (0.08)	0.79 (0.76)	0.02^{***} (0.01)
F-statistic (1st stage)			11.63
(3) Add regional characteristics to (2)	-0.13^{*} (0.08)	1.53^{*} (0.86)	0.02^{***} (0.01)
F-statistic (1st stage)			11.30

Notes: The table reports estimates for two approaches (OLS and 2SLS - 2nd and 1st stages) on the effect of having parents abroad on school achievement.
Individual characteristics include gender and age.
The education levels of each parent are classified into three categories: primary school, secondary education, and tertiary education.
Region characteristics include region fixed effects (indicators for 4 regions) and the index of county development (*Devjud98*).
§ Second-stage coefficient from two-stage least squares using instrumental variables for having parents working abroad.
Standard errors in parentheses are simulated with 200 bootstrap replications and clustered at the community level. *, **, ***
indicates significance at the 10%, 5%, and 1% level, respectively.

Table: Effects of having parents working abroad on the risk of having health problems

	(1)	(2)	(3)	(4)
			Bivariate	First stage
	Probit	2SLS§	probit	coefficient for IV
(1) Individual characteristics only	0.055 (0.08)	0.581* (0.32)	0.370** (0.16)	0.02*** (0.01)
F-statistic (1st stage)				11.90
(2) Add parents's education to (1)	0.064 (0.09)	0.638 (0.42)	0.371* (0.20)	0.02*** (0.01)
F-statistic (1st stage)				9.58
(3) Add regional characteristics to (2)	0.057 (0.09)	0.691 (0.51)	0.429** (0.17)	0.02*** (0.01)
F-statistic (1st stage)				10.16

Notes: The table reports estimates for two approaches (OLS and 2SLS - 2nd and 1st stages) on the effect of having parents abroad on the risk of having health problems.
Individual characteristics include gender and age.
The education levels of each parent are classified into three categories: primary school, secondary education, and tertiary education.
Region characteristics include region fixed effects (indicators for 4 regions) and the index of county development (*Devjud98*).
§ Second-stage coefficient from two-stage least squares using instrumental variables for having parents working abroad.
Standard errors in parentheses are simulated with 200 bootstrap replications and clustered at the community level. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table: Effects of having parents working abroad on being depressed

	(1)	(2)	(3)	(4)
	Probit	2SLS§	Bivariate probit	First stage coefficient for IV
(1) Individual characteristics only	0.078*** (0.02)	0.445 (0.36)	0.415* (0.23)	0.02*** (0.01)
F-statistic (1st stage)				11.90
(2) Add parents's education to (1)	0.076*** (0.03)	0.421 (0.38)	0.308 (0.27)	0.02*** (0.01)
F-statistic (1st stage)				9.58
(3) Add regional characteristics to (2)	0.080*** (0.03)	0.528 (0.46)	0.443* (0.25)	0.02*** (0.01)
F-statistic (1st stage)				10.16

Notes: The table reports estimates for two approaches (OLS and 2SLS - 2nd and 1st stages) on the effect of having parents abroad on the risk of being depressed.
Individual characteristics include gender and age.
The education levels of each parent are classified into three categories: primary school, secondary education, and tertiary education.
Region characteristics include region fixed effects (indicators for 4 regions) and the index of county development (*Devjud98*).
§ Second-stage coefficient from two-stage least squares using instrumental variables for having parents working abroad.
Standard errors in parentheses are simulated with 200 bootstrap replications and clustered at the community level. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table: Effects of having parents working abroad on being bullied

	(1) Probit	(2) 2SLS[§]	(3) Bivariate probit	(4) First stage coefficient for IV
(1) Individual characteristics only	−0.005 (0.03)	0.410 (0.44)	0.273 (0.25)	0.02*** (0.01)
F-statistic (1st stage)				13.19
(2) Add parents's education to (1)	−0.008 (0.03)	0.333 (0.54)	0.222 (0.28)	0.02*** (0.01)
F-statistic (1st stage)				10.37
(3) Add regional characteristics to (2)	−0.011 (0.04)	0.108 (0.58)	−0.054 (0.34)	0.02*** (0.01)
F-statistic (1st stage)				12.02

Notes: The table reports estimates for two approaches (OLS and 2SLS - 2nd and 1st stages) on the effect of having parents abroad on the risk of being bullied.

Individual characteristics include gender and age.

The education levels of each parent are classified into three categories: primary school, secondary education, and tertiary education.

Region characteristics include region fixed effects (indicators for 4 regions) and the index of county development (*Devjud98*).

§ Second-stage coefficient from two-stage least squares using instrumental variables for having parents working abroad.

Standard errors in parentheses are simulated with 200 bootstrap replications and clustered at the community level. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table: Subgroup analysis - 2SLS and Bivariate probit model estimates of the effect of parents' migration on various outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	All	Male	Female	Urban	Rural	Developed counties¶	Least developed counties
Last GPA	2.40**	3.30	2.18*	1.56**	4.76	3.23	2.46*
	(1.01)	(2.50)	(1.15)	(0.78)	(3.54)	(2.04)	(1.43)
Observations	1103	563	540	549	554	511	592
Expected GPA	1.53*	1.28	1.75*	1.36	1.68	4.31	1.07
	(0.86)	(1.43)	(0.94)	(0.93)	(1.56)	(4.81)	(0.88)
Observations	1087	567	520	541	546	501	586
Any illness	0.428**	0.282	0.372	0.156	0.448*	0.500*	0.499**
	(0.17)	(0.31)	(0.36)	(0.29)	(0.26)	(0.29)	(0.24)
Observations	1226	637	589	596	630	561	665
Depression	0.443*	−0.135	0.501**	0.101	0.272	−0.249	0.417
	(0.25)	(0.30)	(0.26)	(0.37)	(0.29)	(0.40)	(0.27)
Observations	1226	637	589	596	630	561	665
Bullying	−0.054	0.095	−0.342	−0.482*	0.390	0.308	0.067
	(0.34)	(0.34)	(0.35)	(0.27)	(0.35)	(0.39)	(0.32)
Observations	1181	620	561	576	605	561	665
Share of children with at least one parent abroad	0.20	0.19	0.21	0.21	0.19	0.15	0.23

Notes: All specifications are based on our preferred specifications: 2SLS for our continuous outcomes and bivariate probit framework for our binary outcomes. All specifications include covariates from model (3) of Tables 1-4.

¶ County's development was defined according to the median value as developed county if index ≥ 11.4732 and least developed county if index < 11.4732.

Standard errors in parentheses are simulated with 200 bootstrap replications and clustered at the community level.

Table: Robustness checks

	Mother's Education			Father's Education			Urban	Devjud98
	Primary Education	Secondary Education	Tertiary Education	Primary Education	Secondary Education	Tertiary Education		
Parent abroad	-0.037	-0.073	0.11	-0.203	0.159	0.044	0.621	-97.72
	(0.471)	(0.363)	(0.356)	(0.431)	(0.385)	(0.281)	(0.83)	(204.18)
Constant	0.802***	-0.139	0.336**	0.652***	0.024	0.324**	0.301	35.159
	(0.168)	(0.179)	(0.135)	(0.17)	(0.188)	(0.127)	(0.23)	(69.32)
F-statistic (1st stage)	11.97	10.64	11.97	12.79	12.79	12.79	19.32	19.32
Observations	1258	1258	1258	1245	1245	1245	1391	1391

Notes: The table reports estimates from the 2SLS approach using control variables as the dependent variable in the second stage. All specifications includes individual characteristics (gender and age).

Standard errors in parentheses are simulated with 200 bootstrap replications and clustered at the community level. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Conclusions

We find initial evidence for a significant positive effect of parents' migration on children's school performance, reflected in higher grades.

However, parents' migration is linked to more serious health problems, and to an increased likelihood of suffering from depression.

Our analysis also reveals that living in a migratory household is less harmful for boys, with girls more likely to suffer depression as a result of parents' migration.

Left-behind children from rural areas are significantly more likely to have health problems than those from urban areas.

While our findings pertain to the specific case of Romania, nevertheless they draw attention to potentially detrimental effects of parental migration on the health of children left-behind.

High-skilled migration

Physicians' brain drain

Alina Botezat, Raul Ramos - Physicians' brain drain - A gravity model of migration flows, in *Globalization and Health*, 2020, 16(1)

Alina Botezat, Doru Botezat - Socio-economic Drivers of Migration Intentions Among Romanian Medical Students: What is the Role of the Intergenerational Transfer of the Medical Profession?. R&R at *BMC Health Services Research*.

Alina Botezat, Andreea Moraru - Brain drain from Romania: What do we know so far about Romanian medical diaspora?, *forthcoming* in *Eastern Journal of European Studies*

Physicians' brain drain

CARANSEBEȘ, (12.09.2008, 15:15)

Migraţia medicilor din România, considerată alarmantă de OMS

Migraţiilor medicilor din România depăşeşte media pe ţară de 2 la sută, considerată de Organizaţia Mondială a Sănătăţii (OMS) cod roşu, adică motiv de criză, care poate face ca un sistem de sanitar să clacheze, pe termen scurt sau mai lung, potrivit preşedintelui CMR, Vasile Astărăstoae.

f Share   482 afişări

Migraţia medicilor din România, considerată alarmantă de OMS (Imagine: Mediafax Foto)

Gândul

La fiecare 6 ore un medic român pleacă din ţară. Imaginea nefardată a dezastrului din Sănătate

Lipsa de echipamente din spitalele de stat, în special din unităţile din provincie, care să asigure realizarea investigaţiilor dar şi a intervenţiilor, corelată cu veniturile sunt principalele cauze ce îi determină pe medici să plece în străinătate pentru a profesa. Doar anul trecut peste 1.800 de medici au cerut documente pentru a putea profesa în străinătate, păstrându-se ritmul plecării acestora din ţară, înregistrat în ultimii ani. Mai exact, la fiecare şase ore un doctor pleacă din România.

Motivation

What are the determinants of migration flows of medical doctors?

A large body of literature has documented the impact of medical doctor's emigration:
Brain drain vs Brain gain

- *negative effects* on various health outcomes, such as mortality rates (Bhargava
et al. 2011; Bhargava and Docquier, 2008), as well as on employment and
economic development of the sending countries (Balaz et al. 2004);

- *positive effects* on human capital accumulation and remittances (Beine et al.
2011; Gibson and McKenzie 2012; Cantore and Cali, 2015).

Annual inflows of foreign-trained physicians by country of destination

during the period 2000 to 2015
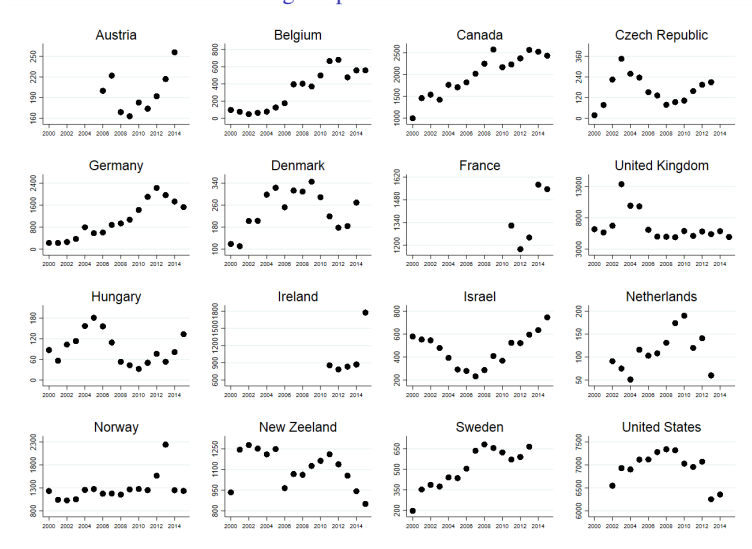
Source: OECD Health Migration Data

Theoretical framework

Random Utility Maximization (RUM) model:

$$U_{ijk} = V_{jk} + \epsilon_{ijk} = w_{jk} - c_{jk} + \epsilon_{ijk} \tag{1}$$

where U_{ijk} represents the utility of individual i after migration from country j to country k. w_{jk} represents the deterministic component of the utility, and c_{jk} the costs of moving from j to k. ϵ_{ijk} is an individual stochastic component of utility.

If it is assumed that ϵ_{ijk} has extreme value type-I distribution, we can apply the results in McFadden (1974) and show that the probability of choosing destination k can be presented by:

$$p_{ijk} = \frac{exp(w_{jk} - c_{jk})}{\sum_{d \in D} exp(w_{jd} - c_{jd})} \tag{2}$$

where d represents any possible destinations out of the set of country choices D.

Similarly, the probability of staying in the country of origin is given by:

$$p_{ijj} = \frac{exp(w_{jj})}{\sum_{d \in D} exp(w_{jd} - c_{jd})} \tag{3}$$

Now we calculate the odds ratio of migrating to k versus staying in j:

$$\frac{p_{ijk}}{p_{ijj}} = \frac{exp(w_{jk} - c_{jk})}{exp(w_{jj})} = exp(w_{jk} - c_{jk} - w_{jj}) \tag{4}$$

But in reality, the decision to migrate is based not solely on the push and pull factors existing in the source and destination countries, but also on the *relative* opportunities and/or obstacles that other possible destinations exhibit at a time.

—— *multilateral resistance to migration* - the bias induced by the time-varying attractiveness of alternative destinations (Bertoli and Moraga, 2013)

Estimation strategy

The estimable equation is the following one:

$$n_{jkt} = \beta_1(\ln X_{k,t-1}) + \beta_2(\ln d_{jk}) + \beta_3(C_{jk}) + \beta_4(EU_{jkt}) + \beta_5(\ln m_{jk,t-1}) + \eta_{jt} + \delta_k + \epsilon_{jkt}$$

n_{jkt} represents physicians' migration flows from country j to country k

$X_{k,t-1}$ includes variables related to destination's characteristics:
   GDP *per capita*, employment rate, remuneration of physicians, PISA reading score, as well
   as variables that describe the supply and demand for health workers.

d_{jk}: physical distance between origin and destination country

C_{jk}: common border, and cultural links (colonial heritage, common language)

EU_{jkt}: A dummy that indicates EU-membership of pair countries

$m_{jk,t-1}$: the stock of immigrant medical doctors trained in country j and living in
country k at the start period t

η_{jt}: time-varying origin dummies

δ_k: destination fixed effects

Estimation strategy

We estimate the equation by means of the **Poisson-pseudo-maximum-likelihood** (PPML) approach as proposed by Santos Silva and Tenreyro (2006).

This method has several advantages:

1. Firstly, a PPML estimator is fully consistent with underlying random utility maximization model presented above.

2. Secondly, the estimator is robust to different patterns of heteroskedasticity (Santos Silva and Tenreyro, 2006).

3. Thirdly, a PPML estimator is particularly suitable in regressions where the dependent variable has a significant proportion of zero values (Santos Silva and Tenreyro, 2011; Beine and Parsons, 2015).

Table: Determinants of migration flows of medical doctors (2000-2015)

	Pseudo-Poisson Maximum Likelihood				
	(1)	(2)	(3)	(4)	(5)
Destination Controls					
Log Unemployment	-0.091	-0.669***	-0.270	-0.916***	-1.119***
rate [t-1]	(0.24)	(0.18)	(0.22)	(0.18)	(0.17)
Log PISA Scorereading [t-1]	-0.036	-0.540	-0.796	-0.901	4.894**
	(2.34)	(1.97)	(2.20)	(1.79)	(2.17)
Dyadic Controls					
Log GDPo/GDPd [t-1]	-0.222	0.289	-0.037	0.932***	1.545***
	(0.34)	(0.34)	(0.34)	(0.34)	(0.35)
Log Diaspora [2000]	0.004	0.004	0.014	0.014	0.034***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Log Distance	-0.691***	-0.697***	-0.847***	-0.864***	-0.635***
	(0.07)	(0.07)	(0.06)	(0.07)	(0.07)
Colonial-tie dummy	0.591***	0.600***	0.598***	0.613***	0.558***
	(0.10)	(0.09)	(0.09)	(0.09)	(0.11)
Common	2.415***	2.375***	2.227***	2.168***	2.679***
language dummy	(0.16)	(0.18)	(0.11)	(0.12)	(0.11)
Contiguity dummy	-0.205**	-0.265***	-0.266***	-0.365***	-0.135
	(0.09)	(0.09)	(0.09)	(0.08)	(0.13)
Both in EU	0.097	0.205*	0.028	0.131	0.624***
	(0.10)	(0.12)	(0.11)	(0.11)	(0.13)
Both in Schengen	0.712***	0.645***	0.750***	0.687***	0.276**
	(0.11)	(0.12)	(0.09)	(0.10)	(0.14)
Destination FE	YES	YES	YES	YES	YES
Origin-time FE	YES	YES	YES	YES	YES
Number of clusters (destination*time)	337	304	303	272	201
Observations	45538	40912	40709	36398	25466
R-sqr	0.671	0.716	0.717	0.771	0.867

Table: Determinants of migration flows of medical doctors (2000-2015) - continued

	Pseudo-Poisson Maximum Likelihood				
	(1)	(2)	(3)	(4)	(5)
Supply factors					
Log Remuneration		1.651*		1.998**	2.107**
of physicians [t-1]		(0.87)		(0.91)	(0.85)
Log Density Physicians		-2.810***		-3.276***	-1.808***
per 1000 population [t-1]		(0.70)		(0.69)	(0.64)
Log Medical Graduates		-0.143		0.234	0.919***
per 100000 population [t-1]		(0.35)		(0.34)	(0.30)
Log Medical Technology [t-1]					1.033***
					(0.40)
Demand factors					
Log public			-0.572	0.153	0.168
health expenditures [t-1]			(0.63)	(0.64)	(0.51)
Log health insurance			-3.105**	-5.232***	-3.337**
coverage [t-1]			(1.46)	(1.47)	(1.68)
Log Age dependency ratio [t-1]			4.853***	2.891***	4.684***
			(1.10)	(0.98)	(1.01)
Log Hospital beds [t-1]			-0.410	0.803*	1.397***
			(0.45)	(0.43)	(0.46)
Destination FE	YES	YES	YES	YES	YES
Origin-time FE	YES	YES	YES	YES	YES
Number of clusters (destination*time)	337	304	303	272	201
Observations	45538	40912	40709	36398	25466
R-sqr	0.671	0.716	0.717	0.771	0.867

Notes: The table reports PPML estimates of the determinants of international migration in the destination country on the inflow of foreign-trained medical doctors. The dependent variable represents the number of foreign-trained physicians who have obtained a (partially or fully) registration to practice as medical doctor in the receiving country at time *t*.

Standard errors in parentheses are clustered by destination and time. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table: Subgroup analysis

Pseudo - Poisson Maximum Likelihood					
Sending regions / time period	Africa	Asia	Central and Eastern European countries	Before economic crisis 2000-2006	During economic crisis 2007-2012
Destination Controls					
Log Unemployment	-1.627**	-2.040***	-1.221***	-0.258	-2.074***
	(0.69)	(0.18)	(0.27)	(0.65)	(0.39)
Log PISA Scorereading [t-1]	-3.543	15.252***	9.973***	7.349	-2.300
	(5.67)	(4.54)	(3.62)	(10.81)	(7.15)
Dyadic Controls					
Log GDPo/GDPd [t-1]	1.372	0.200	2.204***	0.090	2.652**
	(1.17)	(0.36)	(0.69)	(0.63)	(1.27)
Log Diaspora [2000]	-0.533***	0.573***	0.353***	0.457***	0.461***
	(0.08)	(0.19)	(0.06)	(0.11)	(0.11)
Log Distance	-0.880***	0.026	-0.979***	-0.864***	-0.629***
	(0.25)	(0.32)	(0.20)	(0.12)	(0.12)
Colonial-tie dummy	2.478***	1.360***	-1.345***	0.912***	0.463**
	(0.29)	(0.11)	(0.21)	(0.17)	(0.18)
Common	1.202***	0.826***		2.082***	2.633***
language dummy	(0.29)	(0.24)		(0.13)	(0.16)
Contiguity dummy	0.237	6.143***	1.322***	0.128	-0.178
	(0.56)	(0.91)	(0.23)	(0.26)	(0.17)
Both in EU			0.145	0.256	0.551***
			(0.18)	(0.21)	(0.18)
Both in Schengen			0.028	1.193***	0.475**
			(0.17)	(0.23)	(0.21)

Table: Subgroup analysis - continued

Sending regions / time period	Africa	Asia	Central and Eastern European countries	Before economic crisis 2000-2006	During economic crisis 2007-2012
Pseudo - Poisson Maximum Likelihood					
Supply factors					
Log Remuneration of	9.001***	4.789***	-0.558	1.050	6.832*
physicians [t-1]	(3.15)	(1.39)	(1.40)	(1.88)	(3.81)
Log Density Physicians	-6.829***	-3.253***	-0.016	0.256	-6.352**
per 1000 population [t-1]	(1.92)	(1.18)	(1.11)	(1.36)	(2.73)
Log Medical Graduates	1.078	-0.222	1.580***	0.398	2.621***
per 100000 population [t-1]	(0.84)	(0.50)	(0.46)	(0.41)	(0.96)
Log Medical Technology [t-1]	4.150***	-0.220	1.784***	1.012	3.071***
	(1.08)	(0.55)	(0.53)	(0.65)	(0.78)
Demand factors					
Log public	-1.844*	-0.142	0.720	1.026	-3.593*
health expenditures [t-1]	(1.00)	(0.54)	(0.73)	(1.30)	(2.06)
Log health insurance	-6.850*	-10.029***	2.184	-33.308	9.192
coverage [t-1]	(4.14)	(1.79)	(4.06)	(47.68)	(11.07)
Log Age dependency	-21.085***	-0.458	4.225***	8.003**	-16.769***
ratio [t-1]	(6.81)	(3.37)	(1.40)	(3.38)	(5.74)
Log Hospital	-4.016***	-0.098	2.829***	-3.089	1.227
beds [t-1]	(1.24)	(0.38)	(0.97)	(2.03)	(1.20)
Destination FE	YES	YES	YES	YES	YES
Origin-time FE	YES	YES	YES	YES	YES
Number of clusters (destination*time)	168	153	196	54	78
Observations	4193	4532	2495	6549	9726
R^2	0.974	0.978	0.742	0.955	0.787

Notes: The table reports PPML estimates of the determinants of international migration in the destination country on the inflow

Data on migration of health professionals extracted from the LinkedIn platform

- we collected data on the graduates from the Romanian medical schools registered on LinkedIn, working either in Romania or abroad;

- we include in our data set only those who completed the whole medical school in Romania and migrated after graduation;

- the year of emigration is recorded as the year corresponding to the first job abroad;

- data contain information on the graduated school, period of study, year of first job abroad (our proxy for year of emigration), destination country, field of specialization /type of work, gender;

- using data on the period of study, we can approximate the age of the person;

- we anonymized the data;

- our final data set contains approximately 2800 individuals for whom we have completed information.

Related literature

Using social media data to study migration issues

The increasing availability of geo-located Web data represents an alternative for researchers for studying migration.

- Zagheni *et al*. (2014, WWW): use data from the Twitter platform to estimate international migration trends;

- State *et al*. (2014, SocInfo): use LinkedIn data to analyze migration to USA of high-skilled workers.

Table: Summary statistics for our analytical sample

| Year of graduation	N	Abroad (%)	Year of emigration	Migration after ...years after graduation	Male (%)
1990	55	32.73	2004	14	47.27
1991	60	51.66	2003	12	41.66
1992	78	50.00	2002	10	37.17
1993	61	54.09	2003	10	49.18
1994	86	41.86	2002	8	36.04
1995	121	38.84	2002	7	43.80
1996	111	38.73	2004	8	47.74
1997	134	41.79	2005	8	44.02
1998	127	37.00	2005	7	43.30
1999	123	43.08	2005	6	41.80
2000	139	35.25	2006	6	46.76

Source: Authors' calculations using LinkedIn users

Table: Summary statistics for our analytical sample

Year of graduation	N	Abroad (%)	Year of emigration	Migration after ...years after graduation	Male (%)
2001	128	47.65	2006	5	57.03
2002	128	37.09	2008	6	48.38
2003	121	40.49	2008	5	50.41
2004	141	40.42	2009	5	43.26
2005	110	38.18	2009	4	43.11
2006	111	39.63	2010	4	39.63
2007	88	37.50	2010	3	35.22
2008	79	36.70	2010	2	37.97
2009	90	45.55	2011	2	50.00
2010	80	55.00	2012	2	31.25
2011	68	44.11	2012	1	33.82
2012	95	30.52	2013	1	35.78
2013	91	31.86	2014	1	29.67
2014	68	22.05	2014	0	25.00
2015	89	15.73	2015	0	30.33

*Source*: Authors' calculations using LinkedIn users

Preferred destinations by Romanian physicians by year of graduation

Preferred destination countries of Romanian physicians registered on LinkedIn by year of graduation

Preferred destinations by Romanian physicians by year of emigration
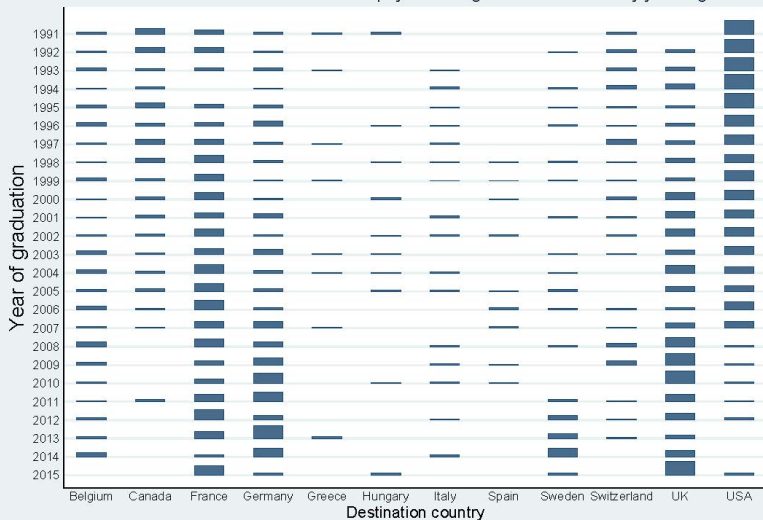
Preferred destinations countries of Romanian physicians by year of emigration
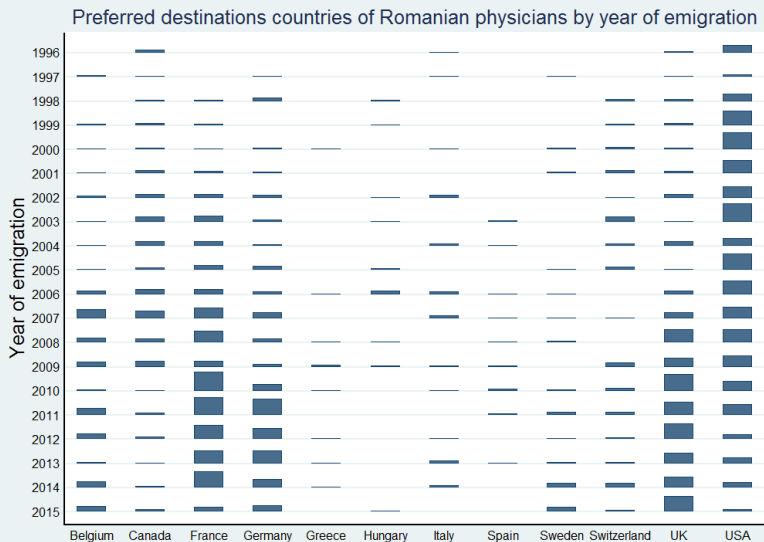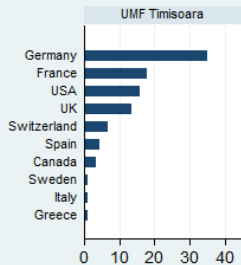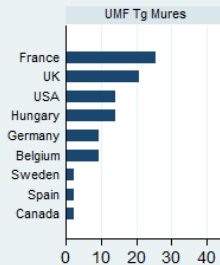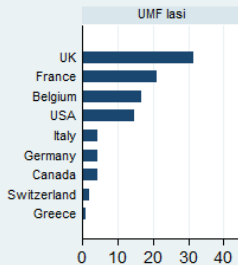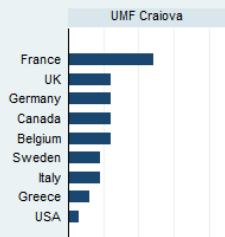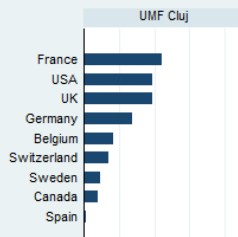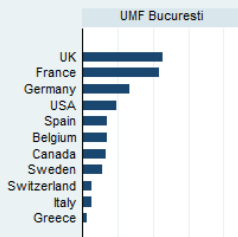
UMF: University of Medicine and Pharmacy

Distribution of medical doctors by speciality and country of destination
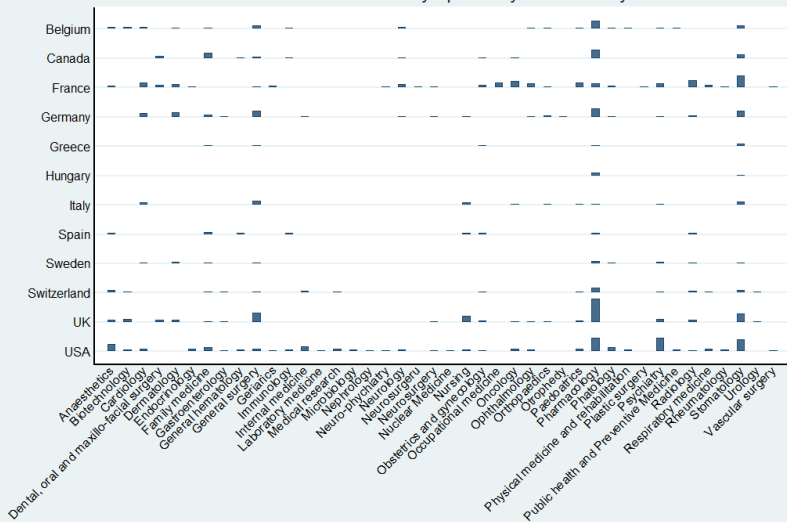
Migration intentions of medical students

In this study we examine the socio-economic drivers of migration
intentions among Romanian medical students.

It also addresses one major gap in this literature that has ignored the
role of the intergenerational transfer of the medical profession.

Background - Romanian Medical Exodus

Among the countries from Eastern Europe, Romania has one of the largest numbers of emigrated young medical doctors in the past decade (Anghel et al., 2017).

The most recent estimates suggest that, following the years of accession to the European Union in 2007, almost 14000 Romanian physicians expressed their intentions to migrate as testified by the number of Certificates for Recognition of Professional Qualifications needed to practice abroad and issued by the Romanian Ministry of Health.

In 2007, for example, 4990 medical doctors, representing more than 10 % of the active medical workforce, expressed their intention to migrate.

In 2010, more than 300 certificates per month were issued to medical doctors. These numbers are really large given the fact that the high-skilled migration rarely exceeded 3 % of the domestic workforce in the EU countries (Wismar *et al.*, 2011).

Number of physicians: 52 541 (2011); 39 846 (2013).

Background - Romanian Medical Exodus

While in the '90s, the Romanian physicians predominantly moved to US and Canada, after 2007, Romanian physicians have mainly migrated to France, Germany, UK and Belgium (Buchan *et al*. 2014).

In 2010, for example, physicians from Romania represented the largest national group (15.4%) of foreign medical doctors in France (Buchan *et al*. 2014).

Data from 2012 reveal that a third of foreign doctors registered in France were Romanians (Sechet and Vasilcu, 2015).

The same situation is in Belgium, where the past years recorded the highest share of Romanian health professionals from the EU12 (Buchan *et al.* 2014).

Related literature

Intention-to-leave of medical students

The focus on the medical students' intention-to-leave is especially relevant due to the following reasons:

> Existing high levels of "youth brain drain", mainly from Eastern European countries, raises a number of concerns, particularly for the sending countries.

> The decision to migrate can be traced back long before an individual's graduation from medical school (Hallock *et al.* 2007).

> Moreover, the decision to study medicine may have been influenced by emigration prospects after graduation: the migration perspectives increase the incentives to pursue a medical education (Chojnicki and Oden-Defoort, 2010), the effects being larger especially for those from low-income countries (Beine *et al.* 2001, 2008).

> From this reason, the medical students' intention-to-leave may thoroughly predict the outflows of medical doctors (Leone *et al.* 2015).

Related literature

Intergenerational transfer of medical profession

It has long been documented that there is a tendency for children to follow into their parents' occupations (Lenz and Laband, 1998; Scoppa, 2009).

These intergenerational transfers are particularly common among physicians, pharmacists, and lawyers, providing substantial advantages for those who follow in these careers (occupation-specific knowledge and resources, inside information,social connections etc.).

The proportion of medical students in various countries who report having at least a parent physician ranges between 10 and 25 percent (Tran *et al.* 2017).

Among medical undergraduates, predominantly more males than females report to have a medical parent or to have relatives in the medical profession (Vaglum *et al.* 1999; Arulampalam, 2007).

Having a parent physician might influence the pursued specialty: those with a father physician have an incentive to choose more prestigious specialties such as surgery, neurology etc. (Vaglum *et al.* 1999).

Data

We use data from an in-class survey carried out among Romanian medical students attending "Gr.T.Popa" University of Medicine and Pharmacy Iasi, whose catchment area is Eastern and North-Eastern Romania.

The survey was conducted in winter term 2016-2017, spanning a period of three months.

Of the 1700 medical students enrolled at the Faculty of Medicine, we obtained responses from 1058 (61.9%).

Individuals were excluded if they graduated high school in a foreign country.

Our final analytical sample consists of 1038 individuals.

Data

- **Outcome variable**

Our main variable of interest is *probability of migration intention* and is measured with a ten-point Likert scale.

The *probability of migration intention* is assessed using the following measure:

> *On a scale from 1 to 10, how would you appreciate the probability to emigrate in the future?*

For ease of interpretation, we treat the variable as cardinal rather than ordinal (Ferrer-i-Carbonell and Frijters, 2004).

Conditioning variables

The set of conditioning variables includes: age, gender, land, house and car ownership (proxies for family wealth), parents' education, at least one parent is medical doctor, baccalaureate grade, location graduated high-school (small town, town and city), year of enrollment, planned medical specialty to pursue.

Empirical strategy

The empirical model:

$$Y_i = \alpha_0 + \alpha_1 Doctor_i + \alpha_2 X_i + \epsilon_i$$

where:

Y_i represents the probability of migration intention.

and

$Doctor_i$ equals 1 if at least one parent is physician.

X_i includes the conditioning variables..

$$Y_i = \delta_0 + \delta_1 Doctor_{mother-only} + \delta_2 Doctor_{father-only} + \delta_3 Doctor_{both-parents} + \delta_4 X_i + \epsilon_i$$

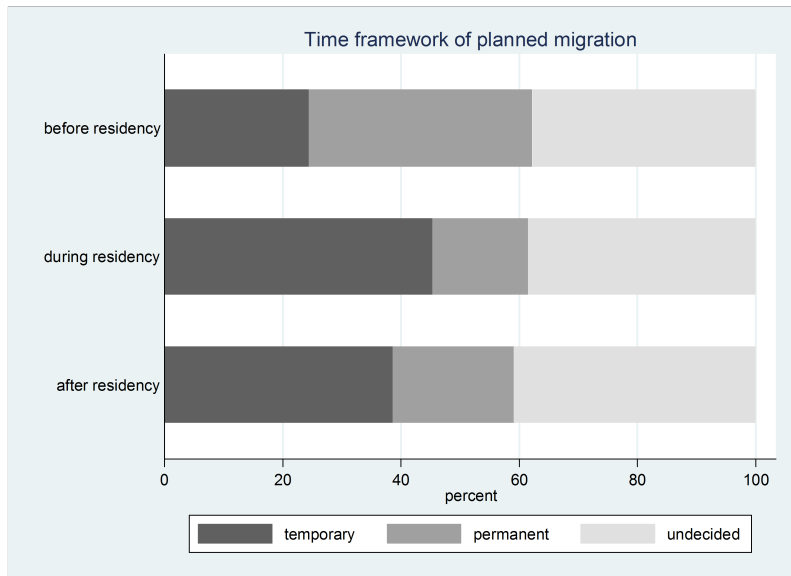Table: Summary statistics for our analytical sample

Variable	Mean	Min	Max
Outcome variable			
Probability to emigrate	5.95	1	10
Individual characteristics			
Age	22.41	20	26
Female	0.80	0	1
Family wealth and economic status			
Land ownership	0.58	0	1
House ownership	0.97	0	1
Car ownership	0.76	0	1
Parent's education			
Mother's education			
Primary education	0.05	0	1
Secondary education	0.46	0	1
Tertiary education	0.49	0	1
Father's education			
Primary education	0.05	0	1
Secondary education	0.49	0	1
Tertiary education	0.46	0	1
At least one parent is physician	0.11	0	1

Source: Authors' calculations using survey data

Table: Summary statistics for our analytical sample (cont'd)

Baccalaureate grade	9.22	7	10
Location graduated high-school			
Small town (less than 15000 inhabitants)	0.06	0	1
Town (between 15000 and 100000 inhabitants)	0.36	0	1
City (between 100 000 and 2000000 inhabitants)	0.58	0	1
Year of enrollment at the University of Medicine			
2010	0.06	0	1
2011	0.17	0	1
2012	0.16	0	1
2013	0.22	0	1
2014	0.15	0	1
2015	0.25	0	1
Planned medical specialty to pursue			
Cardiology	0.04	0	1
Dental medicine	0.04	0	1
Dermatology	0.04	0	1
Emergency medicine	0.05	0	1
Legal medicine	0.03	0	1
Neurology	0.04	0	1
Obstetrics and gynecology	0.08	0	1
Oncology	0.02	0	1
Ophthalmology	0.03	0	1
Pediatrics	0.10	0	1
Pharmacology	0.07	0	1
Plastic surgery	0.03	0	1
Radiology	0.04	0	1
Other specialties	0.39	0	1
N		1038	

Time framework of planned migration
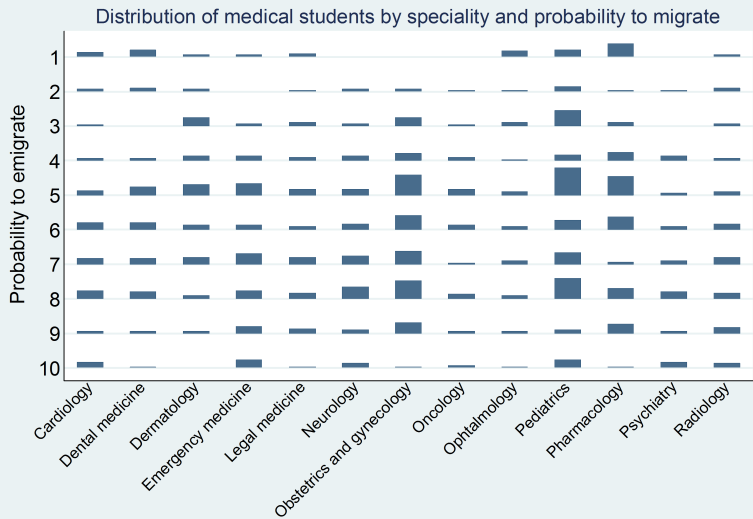
Distribution of medical students by speciality and probability to migrate

Table: Probability of migration intention among Romanian medical students

	(a)	(b)	(c)	(d)	(e)
At least one parent is physician	0.86*** (0.24)	0.85*** (0.25)	0.72*** (0.26)	0.68** (0.27)	0.71*** (0.27)
Female		-0.34* (0.20)	-0.37* (0.20)	-0.29 (0.21)	-0.29 (0.21)
Land ownership		0.12 (0.16)	0.11 (0.16)	0.14 (0.16)	0.12 (0.16)
House ownership		-0.88** (0.40)	-0.85* (0.40)	-0.90** (0.41)	-0.83** (0.42)
Car ownership		-0.16 (0.18)	-0.25 (0.19)	-0.17 (0.19)	-0.11 (0.19)
Parent's education(Ref.:secondary or less)					
Mother's tertiary education			0.25 (0.19)	0.21 (0.20)	0.14 (0.20)
Father's tertiary education			0.002 (0.20)	0.01 (0.20)	0.04 (0.20)
Baccalaureate grade				-0.10 (0.17)	-0.19 (0.17)
School's location (Ref.: small town)					
Town				0.20 (0.33)	0.26 (0.32)
City				0.52 (0.33)	0.57* (0.31)
Planned medical specialty to pursue (Ref.:Other specialities)					
Dental medicine					-0.81* (0.48)
Dermatology					-0.96** (0.37)
Emergency medicine					0.98*** (0.35)
Ophthalmology					-1.05* (0.58)
Plastic surgery					1.18** (0.47)
Observations	1001	995	973	932	918
R^2	0.01	0.03	0.03	0.05	0.09

Other background controls:

(b)-(e): Age;
(d)-(e): Year of enrollment;
(e): Other specialties: Cardiology, Legal medicine, Neurology, Obstetrics and
gynecology, Oncology, Pediatrics, Pharmacology and Radiology.
Reference category: "Other specialties".

Table: Probability of migration intention among Romanian medical students

	(a)	(b)	(c)	(d)	(e)
Only mother is physician	0.83**	0.79**	0.61*	0.50	0.56
	(0.34)	(0.34)	(0.35)	(0.36)	(0.37)
Only father is physician	0.04	0.07	0.05	0.04	0.19
	(0.53)	(0.52)	(0.54)	(0.59)	(0.56)
Both parents are physicians	1.56***	1.60***	1.48***	1.57***	1.43***
	(0.35)	(0.35)	(0.37)	(0.37)	(0.39)
Observations	1001	995	973	932	918
R^2	0.01	0.03	0.03	0.05	0.09

Note: (a) - (e): Same specifications as before.

Standard errors in parentheses. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Table: Probability of migration intention among Romanian medical students

	Outside Iasi		From Iasi		Bac. Grade< 9.3		Bac. Grade≥ 9.3	
	(b)	(e)	(b)	(e)	(b)	(e)	(b)	(e)
At least one parent is physician	0.90***	0.77**	0.45	0.44	1.06***	1.00***	0.80**	0.47
	(0.31)	(0.33)	(0.40)	(0.44)	(0.33)	(0.37)	(0.35)	(0.38)
Observations	686	645	308	295	477	434	518	492
R2	0.03	0.10	0.05	0.14	0.05	0.18	0.03	0.12

Note: (b) and (e): Same specifications as before.

Standard errors in parentheses. *, **, *** indicates significance at the 10%, 5%, and 1% level, respectively.

Conclusions

This paper analyzes whether medical students who follow the career of their parents differ, in terms of emigration intentions after graduation, from the children of non-doctors.

The empirical findings interestingly reveal that children from families in which at least one parent is a physician are more likely to plan to migrate after graduation, compared to children whose parents have other professions.

This effect is stronger for those with both parents working as doctors and appears to be largely driven by students who were compelled to move out of their hometown to study medicine.

Conclusions

At least three reasons may be proposed on why physicians' children are more likely
to plan to migrate.

They are much more likely to have inside information and thus a good
knowledge of the Romanian health system. Being better informed as "insiders"
compared to "outsiders", they might prefer to leave the country after
graduation.

They may benefit from their parents' network of relationships which, given the
fact that emigration is a common phenomenon among Romanian medical
doctors, most likely extends abroad as well.

Since most of the children of physicians come from geographical districts
outside the university medical center, their parents might exert less influence in
terms of favoritism, compared to parents who reside and work in close
proximity to the university center. Furthermore, given the gaps in the medical
infrastructure between center and remote areas in the Romanian health system,
those who have lower chances to find a position in the university medical
center might find better opportunities through migration.

Thank you very much for your attention! ⌣

Distribution of Romanian medical doctors by speciality and year of migration