

***Mais Médicos* Program and Human Capital in Argentina: Brain Drain in the Health Sector?**

Fernando Antonio Ignacio González
Facultad de Ciencias Económicas, Universidad Nacional de Misiones
Posadas, Argentina
fernando.gonzalez@fce.unam.edu.ar

Lara Sofía Cantero
Facultad de Ciencias Económicas, Universidad Nacional de Misiones
Posadas, Argentina

Pablo Szyszko
Facultad de Ciencias Económicas, Universidad Nacional de Misiones
Posadas, Argentina

Joel Heman Bys
Facultad de Ciencias Económicas, Universidad Nacional de Misiones
Posadas, Argentina

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Fernando Antonio Ignacio González

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Posadas, Argentina

Joel Heman Bys

Facultad de Ciencias Económicas, Universidad Nacional de Misiones

Posadas, Argentina

Abstract

The *Mais Médicos* program (2013) tried to attract physicians to rural and peripheral areas of Brazil based on the international immigration of these professionals. Its creation generated widespread concern in the border areas of Argentina due to the potential brain drain (emigration of qualified professionals) in the health sector. In this paper we provide evidence on this topic. The identification strategy exploits the plausibly exogenous timing in the implementation of the program and the different levels of proximity of the Argentine provinces with respect to Brazil. The results suggest that, despite the widespread belief of a brain drain towards Brazil, the availability of physicians did not show a significant reduction, after the program, in the border areas. This is robust against multiple checks and placebos. From a territorial equity perspective, there is no evidence that the creation of the program has contributed to widening regional disparities in Argentina (i.e. fewer physicians in the poorest region).

Keywords: Mais Médicos, physicians, brain drain, Argentina, Misiones.

1. Introduction

At the global level, there is a persistent deficit of health professionals -especially physicians and in developing countries- and it is estimated that, by 2030, this deficit could amount to 9.9 million physicians, nurses and midwives (World Health Organization [WHO], 2016). This is an important limitation for the functioning of health systems and becomes particularly critical during episodes of environmental shocks such as epidemics. For this reason, several countries have implemented programs to attract foreign physicians: *Mais Médicos* (More Physicians) in Brazil, Overseas Trained Doctors in Australia, Conrad 30 in the USA, among others (Oliveira et al, 2015). Its impact on the stock of physicians in other developing countries is ambiguous: on the one hand, it encourages the emigration of professionals -leading to a brain drain in the country of origin. On the other hand, it can stimulate a greater number of people to invest in education in these careers given the better job opportunities (Grubel & Scott, 1966; Abarcar & Theoharides, 2021).

In this paper we examine the impact of a program (*Mais Médicos* from Brasil) that increases the demand for foreign physicians on the stock of physicians in the country of origin. Given the extensive social and cultural links (Jaguaribe, 1982), together with its geographical proximity, we

examine this impact for the case of Argentina. Both countries (Brazil and Argentina) share an extensive border, dry and fluvial, of more than 1,200 km, and Argentina is the country in the region with the largest stock of physicians after Brazil and Colombia (WHO, 2021). In addition, at the time of the implementation of the program, there was widespread concern about the brain drain in the Argentine border areas with Brazil. Figure 1 collects the headlines of the time of the main Argentine newspapers. There he became aware of an apparent brain drain in localities in the interior of the Province of Misiones, as pointed out by the then Minister of Health of that province.

Figure 1: Concern in Argentine newspapers about emigration of physicians to Brazil

UN FENÓMENO QUE INQUIETA
Médicos de Argentina se van a Brasil por el doble de sueldo

Es por un plan del Dilma Rousseff, que les ofrece 4.200 dólares por mes y 40 horas de trabajo por semana. En localidades fronterizas hay preocupación porque emigran los pocos médicos que tienen.

a)

LA NACION · Sociedad

Médicos de Misiones se van a Brasil porque ganan más plata

El ministro de Salud Pública de la provincia, Oscar Herrera Ahuad, admitió que en los últimos meses se registra un éxodo

13 de enero de 2014 · 13:01

b)

Misiones sufre el éxodo de médicos que se van a Brasil a ganar el doble

Los directivos del hospital público Samic de Puerto Iguazú, en el norte de Misiones, convocaron ayer a profesionales en distintas especialidades a raíz del éxodo de casi la mitad de sus...

20 de febrero 2014 · 01:00hs

c)



Source: own elaboration based on Clarín, La Nación and La Capital.

Note: the titles from panel a, b and c state: “Physicians from Argentina go to Brazil for twice the salary”; “Physicians from Misiones go to Brazil because they earn more money”; “Misiones suffers the exodus of physicians who go to Brazil to earn double”. The news from panels a, b and c can be consulted in [Clarín](#), [La Nación](#) y [La Capital](#), respectively.

The identification strategy exploits the timing, plausibly exogenous, in the implementation of the *Mais Médicos* program and the different levels of proximity of the Argentine provinces with Brazil. The provinces of Misiones and Corrientes (Northeast region) have a border with Brazil and a wide economic and cultural influence on the part of this country. Thus, it is to be expected that, in the event of a brain drain, these provinces will be the most affected. This assumes that the decision to migrate is influenced by geographic, social and cultural proximity to the host country (Munshi, 2003). Also, the Northeast region of Argentina has persistently evidenced the lowest salaries for health professionals (Table A.1), as well as the highest levels of poverty (González, 2018; González & Santos, 2020). Potential structural differences between Argentine provinces are considered by including socio-economic and demographic controls together with geographical (per province) and temporal (per year) fixed effects.

The findings show that, after the implementation of the program and despite the widespread concern about the brain drain in the sector, the stock of physicians in the border areas did not show a statistically significant reduction in relation to the other provinces. This result is robust against multiple robustness checks: comparison between different sources of information (household microdata vs. administrative records of licensed physicians), disaggregation by subgroups (gender and place of residence) and inclusion of different controls. In certain specifications (Tables 2 and 3), there is even a positive effect (i.e. evidence of brain gain in the border areas of Argentina).

This work contributes to the brain drain literature in two ways. On the one hand, it is the first study to provide causal evidence on the impact of the *Mais Médicos* program in Argentina. Second, to the best of our knowledge, it is the first study to study the brain drain in the health sector between two developing countries in the same region. Typically, the literature has focused on examining those cases where the receiving country is a developed economy and, moreover, is located in a different region from that of the sending country. This is an advantage for the estimation strategy of this work. The broad historical, cultural, and economic similarities between the two countries allow us to assume that the migration of health professionals, if it exists, responds to the better working conditions offered by the program and not to other structural factors that may differ between countries.

In this context, the empirical literature on brain drain has shown conflicting results. On the one hand, Abarcar & Theorides (2021) examine the impact of a visa program for nurses in the United States on the stock of these professionals in the Philippines. They report that, despite the large emigration to the United States, the net effect was positive. This responds to the fact that more students enrolled in this career -due to better job prospects- more than offsetting the emigration effect. Bein et al. (2008) examine cross-sectional data from 127 developing countries and report a positive effect: doubling the emigration rate of skilled workers increases the human capital of professionals in the sending country by 5%. In the same sense, other works have reported evidence of a brain gain -positive effect on the stock of workers in the sending country- in developing countries (Clemens, 2007; Shrestha, 2017; Djajic et al., 2018; Chad & Clemens, 2019; Khanna & Morales, 2021).

On the other hand, Docquier et al. (2008) examine 108 developing countries and report that higher levels of emigration of qualified professionals tend to reduce human capital in sending countries -although there are heterogeneous effects-. Furthermore, the authors provide evidence that education subsidies tend to reduce the emigration of qualified professionals. That is, subsidies and emigration are substitutes. Bhargava & Docquier (2008) report that the emigration of physicians from Sub-Saharan Africa tends to increase the incidence of HIV in the sending countries. Thus, doubling the rate of physician emigration is associated with a 20% increase in adult mortality from HIV. The foregoing, however, does not translate into a reduction in life expectancy in these countries. An extensive review on the migration of skilled workers and its effects on development can be found in Docquier & Rapoport (2021).

From now on, section 2 presents a brief description of the *Mais Médicos* program. Sections 3 and 4 describe the sources of information and the identification strategy used, respectively. Section 5 presents the main results and, finally, section 6 advances with the conclusions of the work.

2. *Mais Médicos* Program

Mais Médicos was a program created by the federal government of Brazil in July 2013 and whose main objective was to reduce the deficit in primary health care in rural and peripheral areas of

that country¹. To this end, the program contemplated the construction of new health care centers, new medicine schools and the opening of new positions for resident physicians. Also, the immigration of foreign physicians was encouraged to improve coverage in those areas where Brazilian physicians were not enough -commonly rural municipalities and far from large urbanizations and with a high incidence of poverty- (Hone et al., 2020).

In the first year of the program, about 15,000 physicians participated. The program attracted the attention of foreign physicians by offering competitive hiring conditions. The starting salary varied according to region and specialty, but was around US\$4,500 per month. In addition, subsidies were offered for relocation and housing in the place of destination (Silva et al., 2018). Also, the program contemplated the relaxation of bureaucratic requirements so that foreign physicians could work in Brazil (Pereira et al., 2016). Contracts were stipulated for a period of three years, renewable for the same period.

The evidence that emerges from the evaluations of the program suggests that its implementation improved, in the municipalities included, user satisfaction, quality of service and reduced hospitalizations (Hone et al., 2020). In particular, a reduction in waiting times for patients, an increase in the frequency of visits to health centers and a reduction in hospitalizations for diarrhea or gastroenteritis have been observed. However, the program does not appear to have had a significant impact on infant mortality, birth weight, or preterm birth (Mazetto, 2018).

3. Sources of information

In this work we combine two sources of information. On the one hand, we use microdata from the Annual Survey of Urban Households (EAHU in Spanish) prepared by the National Institute of Statistics and Censuses (INDEC). The EAHU is carried out in the third quarter of each year and covers the 2010-2019 period. However, microdata for the year 2015 are not available². The sample size of each wave of the survey is approximately 46,000 homes. The EAHU includes the 31 urban clusters surveyed in the Permanent Household Survey (EPH)³ and, in addition, includes private homes in localities with 2,000 or more inhabitants. In this way, the EAHU allows a greater geographical coverage by including small towns.

The EAHU is a multipurpose survey that allows knowing different socio-economic indicators of the people surveyed. This includes labor status (employed, unemployed, inactive), income, educational level, sector of activity of the main occupation, as well as indicators such as age, gender and province of residence. Table 1 below summarizes the main indicators used from this source.

Table 1: Descriptive statistics of selected indicators

¹ In 2019, the program was replaced by a similar one -Médicos pelo Brasil- (Governo Federal do Brasil, 2021).

² The lack of publication of the microdata for that year occurred in the context of the INDEC statistical blackout. The details of the blackout can be consulted at:

https://www.indec.gob.ar/ftp/documentos/sintesis_gestion_indec_2015_2019.pdf

³ The 31 clusters are: Posadas (Misiones), Gran Resistencia (Chaco), Corrientes and Formosa in the Northeast region (NEA). In the Northwest region are (NOA), Santiago del Estero-La Banda, Jujuy-Palpalá, Gran Catamarca, Salta, La Rioja and Gran Tucumán-Tafí Viejo. The Central region includes Gran Córdoba, Río Cuarto, Gran Santa Fe, Gran Rosario, Gran Paraná, Concordia, Bahía Blanca-Cerri, Greater La Plata, Mar del Plata-Batán and San Nicolás-Villa Constitución. The southern region (Patagonia) includes Rawson-Trelew, Comodoro Rivadavia-Rada Tilly, Río Gallegos, Santa Rosa-Toay, Ushuaia-Río Grande and Viedma-Carmen de Patagones. Gran Buenos Aires encompasses the City of Buenos Aires and the surrounding districts of the Province of Buenos Aires. The Cuyo region includes Gran Mendoza, Gran San Juan and Gran San Luis.

| Variable | Mean | Standard deviation | Mínimum | Maximum |
|---------------------------|--------|--------------------|---------|---------|
| Physicians per inhabitant | 0.0078 | 0.0048 | 0.0016 | 0.0329 |
| Average age | 45.68 | 10.46 | 22 | 75 |
| Employment rate | 0.3973 | 0.0394 | 0.2867 | 0.5242 |
| Male proportion | 0.4878 | 0.0114 | 0.4483 | 0.5102 |

Source: Own elaboration based on EAHU-INDEC.

Note: Physicians are identified as those professionals with at least five years of completed university studies and whose main occupation is “Human health care activities”.

Although the data provided by the EAHU makes it possible to identify the sector of activity of each person's main occupation, as well as their educational level, this does not guarantee the precise identification of medical professionals within health professionals. Therefore, we complement the EAHU microdata with administrative records of licensed physicians. These data come from the Federal Network of Registration of Health Professionals (REFEPS). REFEPS records integrate updated information on the number of professionals licensed in each jurisdiction of the country (including the City of Buenos Aires). These records cover the period 2012-2018.

4. Identification strategy

The identification strategy of this work exploits the timing, plausibly exogenous, in the implementation of the program and the difference in proximity of the Argentine provinces with respect to Brazil. The foregoing assumes that the provinces closest to Brazil experience, if any, a greater impact. Therefore, equation 1 is estimated:

$$M_{it} = \beta_0 Treated_i Program_t + X_{it} + \gamma_i + \delta_t + \mu_{it} \quad (1)$$

where M_{it} is the stock of physicians per inhabitant of province i in year t . $Treated_i$ is a dummy variable that takes the value 1 for treated provinces and 0 otherwise. The provinces of Misiones and Corrientes -those with a border with Brazil and where a greater concern arose with its creation (see Figure 1)- constitutes the treatment group. $Program_t$ is a dummy variable that takes the value 1 for the years with the program in force. Since 2014 is the first full year with the program in force, this year is considered as the start of the program. Alternatively, 2013 is considered as the starting year. X_{it} is a vector of control variables (male proportion, employment rate and average age). γ_i and δ_t are geographic and time fixed effects, respectively. μ_{it} is the model error term.

The coefficient of interest, β_0 , captures the differential impact of the implementation of the program on the provinces bordering Brazil, in relation to the other provinces. In case a brain drain has taken place, the coefficient is expected to be negative and significant.

Equation 1 is re-estimated by considering multiple robustness checks. First, two different sources of information are considered to estimate the stock of physicians. On the one hand, the Annual Survey of Urban Households is used, which provides a greater temporal scope (2010-2019) but

does not allow physicians to be precisely identified (see section 3). On the other hand, the administrative records of physicians licensed by province are used. This allows a precise identification of medical professionals at the cost of a shorter time scope (2012-2018). Second, different specifications are considered by excluding control variables and fixed effects. Third, different disaggregations are implemented: analysis of the stock of physicians by gender and by place of residence. Fourth, potential adjustments are analyzed in the extensive and intensive margins (hours worked and remuneration per hour) in the medical labor market.

5. Results

Table 2 presents the results that arise from estimating equation 1. From the preferred specification (column 4, which includes fixed effects and controls) it appears that there are no significant differences in the number of physicians per inhabitant. That is, the availability of physicians in the provinces of Misiones and Corrientes, after the implementation of the *Mais Médicos* program, does not show significant changes in relation to the other provinces. In the less complete specifications (columns 1 and 3, which do not include fixed effects or controls), significant differences emerge consistent with the idea of a gain in brains in the border areas.

Table 2: *Mais Médicos* Program and availability of physicians in Argentine provinces (2010-2019)

| Regressor | 1 | 2 | 3 | 4 |
|--------------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Treatment* <i>Mais Médicos</i> | .0029458*** (.0002443) | .0008013 (.0008786) | .0018686*** (.0003891) | .0014217** (.00067) |
| Average age | | .0003745** (.0001757) | | .0003614 (.0003042) |
| Male proportion | | -.0478551** (.0196847) | | -.0352446 (.0298385) |
| Employment rate | | .0381634*** (.0137788) | | .0225179*** (.0084309) |
| Fixed effects | No | No | Yes | Yes |
| N | 215 | 215 | 215 | 215 |
| R ² | 0.0536 | 0.1986 | 0.1843 | 0.2428 |

Source: Own elaboration based on EAHU.

Note: Robust and clustered standard errors at the province level in parentheses. The treatment group includes the provinces of Misiones and Corrientes and where the first full year of the program in force is 2014.

In a complementary way, a battery of robustness checks is considered. First, Table 3 shows that the number of physicians in the provincial interiors in border areas (Misiones and Corrientes) increased after the implementation of the program, in relation to the other provinces. No significant differences are observed when comparing between genders. The previous result is especially relevant since it suggests that the program could have contributed to reducing territorial inequities not only between Argentine provinces but also within them: typically the provincial

interiors (small urban agglomerations and rural areas) have a lower stock of physicians than the provincial capitals.

Table 3: *Mais Médicos* Program and availability of physicians in Argentine provinces in subgroups (2010-2019)

| Regressor | Men | Women | Provincial interiors | Provincial capitals |
|--------------------------------|-------------------------|------------------------|--------------------------|--------------------------|
| Treatment* <i>Mais Médicos</i> | .000022 (.0005075) | .0013722 (.0010403) | .0020432** (.0009192) | -.0006215 (.0004944) |
| Average age | .0003103* (.0001823) | .0000987 (.0001832) | .0001072 (.0001847) | .0002541 (.0002812) |
| Male proportion | | | -.0178236 (.015718) | -.0174211 (.0246702) |
| Employment rate | .0097109* (.0058304) | .0095644 (.0074811) | .0078292 (.0078411) | .0146887** (.0068507) |
| Fixed effects | Yes | Yes | Yes | Yes |
| N | 215 | 215 | 215 | 215 |
| R ² | 0.2015 | 0.1196 | 0.1961 | 0.0903 |

Source: Own elaboration based on EAHU.

Note: Robust and clustered standard errors at the province level in parentheses. The treatment group includes the provinces of Misiones and Corrientes and where the first full year of the program in force is 2014.

Second, the adjustments in the extensive (hours worked) and intensive (remuneration per hour) margins are analyzed as potential coping mechanisms to retain physicians. Table 4 shows that there were no significant changes in the number of hours worked or in remuneration per hour worked. Thus, there is no evidence of improvements in the working conditions of physicians who remain in the Argentine health system after the *Mais Médicos* program came into force.

Table 4: Adjustments in extensive and intensive margin after the *Mais Médicos* Program (2010-2019)

| Regressor | Extensive margin | Intensive margin |
|--------------------------------|-------------------------|---------------------------|
| Treatment* <i>Mais Médicos</i> | -1.554524 (2.411086) | -28.55371 (49.89481) |
| Average age | .5415231 (.5714632) | -8.972751 (18.63946) |
| Male proportion | 1.20338* (.6305041) | -58.78387** (26.01116) |

| | | |
|-----------------|-------------------------|-------------------------|
| Employment rate | -10.73969 (33.22536) | -16.08255 (11.11146) |
| Fixed effects | Yes | Yes |
| N | 215 | 215 |
| R ² | 0.0560 | 0.7809 |

Source: Own elaboration based on EAHU.

Note: Robust and clustered standard errors at the province level in parentheses. The treatment group includes the provinces of Misiones and Corrientes and where the first full year of the program in force is 2014.

Third, equation 1 is re-estimated when considering administrative records of physicians licensed by province. Although the point estimate is positive, it is not significantly different from zero. The foregoing indicates that, when considering the administrative records of licensed physicians and a shorter time period (2012-2018), there is no significant effect of the *Mais Médicos* program. In any case, this confirms the absence of a brain drain in the health sector.

Table 5: *Mais Médicos* Program and physicians licensed in Argentine provinces (2012-2018)

| Regressor | Coefficient |
|--------------------------------|-------------------------|
| Treatment* <i>Mais Médicos</i> | .603866 (1.072187) |
| Average age | .0724524 (.158549) |
| Male proportion | -6.859105 (20.371) |
| Employment rate | -7.412956 (8.869606) |
| Fixed effects | Yes |
| N | 215 |
| R ² | 0.1641 |

Source: Own elaboration based on the Ministry of Health.

Note: Robust and clustered standard errors at the province level in parentheses. The treatment group includes the provinces of Misiones and Corrientes and where the first full year of the program in force is 2014.

Additionally, time placebos are implemented in which the implementation of the program is fictionally advanced (Table A.2 in the Annex). No significant differences should arise from this. Table A.3 considers the potential existence of heterogeneous effects between provinces and over time, and implements the estimator proposed in Chaisemartin and D'Haultfœuille (2020).

The results reported here are not consistent with the hypothesis of brain drain in the health sector in Argentina after the implementation of the *Mais Médicos* program. Depending on the specification, null results or a positive effect (i.e. brain gain) are observed. These findings are similar to those reported in Abarcar & Theoharides (2021). There, the authors show that the expansion of a US visa program for nurses did not reduce the stock of these workers in the Philippines (the most frequent country of origin among nurses who migrated to the US) and that, in addition, the enrollment of Filipino students in this career increased. In our work, however, it does not seem feasible that the non-decrease in the stock of physicians is due to a compensation between those who emigrate and an increase in the number of graduates. Even if there had been an increase in enrollment in Medicine, the period considered after the implementation of the program (2014-2019) does not seem long enough to ensure that new students have entered the labor market.

6. Conclusions

In this paper we have examined the impact of the *Mais Médicos* program on the stock of physicians in the Argentine areas bordering Brazil. Based on a differences-in-differences estimation, we combined administrative records of licensed physicians and household microdata from a survey with broad territorial coverage (Annual Survey of Urban Households).

During the first months of the program, the most important newspapers in Argentina showed widespread concern about the potential brain drain from the health sector to Brazil (Figure 1). In addition, the program indicated worrying distributional implications: it could contribute to widening the deep territorial disparities in Argentina. The provinces of the NEA region were, before the implementation of the program, those with the lowest number of physicians per inhabitant and with the highest incidence of poverty.

Despite the above, the findings of this work show that a brain drain of medical professionals did not take place in the border areas of Argentina. The results are robust when considering different sources of information (household microdata vs. administrative records of licensed physicians) and against multiple disaggregations (by gender and place of residence). In all cases, the results show that there was no statistically significant negative differential impact in the border areas after the implementation of the program. In addition, in some specifications, a positive effect appears (i.e. brain gain).

In the future, it is relevant to investigate possible indirect effects. This includes, first of all, examining the levels of enrollment in medical schools. It seems to be expected, considering the previous literature, that more people have been linked to this career given the better job opportunities. Second, it is pertinent to investigate, with greater depth and precision, about the mechanisms that may have prevented the brain drain in the health sector. This refers to the working conditions of physicians such as pay and hours worked. From the current administrative records, however, it is not possible to obtain this information. Due to the foregoing, the need to have updated and detailed records of the operation of the sector and its professionals is highlighted.

Annex

Table A.1: Monetary income of physicians in Argentine regions (2019)

| Region | Average income |
|--------|----------------|
| NEA | 36178.82 |

| | |
|-----------|----------|
| NOA | 44812.96 |
| Cuyo | 43531.34 |
| Centro | 48422.17 |
| Patagonia | 48361.05 |

Source: Own elaboration based on EAHU. Note: values in current pesos of the year 2019.

Table A.2: Placebos and *Mais Médicos* Program (2010-2019)

| Regressor | 1 | 2 |
|--------------------------------|-------------------------|---------------------------|
| Treatment* <i>Mais Médicos</i> | .0004455 (.0005579) | .0005298 (.000437) |
| Average age | .0003613 (.0003037) | .0003609 (.0003037) |
| Male proportion | -.034309 (.0294871) | -.0344958 (.0296353) |
| Employment rate | .02411*** (.0087491) | .0242333*** (.0087811) |
| Fixed effects | Yes | Yes |
| N | 215 | 215 |
| R ² | 0.2335 | 0.2336 |

Source: Own elaboration based on EAHU.

Note: The treatment group includes the provinces of Misiones and Corrientes and where the first full year of the program in force is fictitiously advanced one (column 1) and two years (column 2). Since it is a placebo, no significant effects should appear.

Table A.3: Heterogeneous effects and *Mais Médicos* Program (2010-2019)

| Regressor | Treatment effect |
|------------------------|------------------------|
| Estimator | .0029253 (.0007341) |
| Límite inferior IC 95% | .0014866 |
| Límite superior IC 95% | .0043641 |
| Groups | 24 |
| Switchers | 2 |

Source: Own elaboration based on EAHU.

Note: Robust and clustered standard errors at the province level in parentheses. The treatment group includes the provinces of Misiones and Corrientes and where the first full year of the program in force is 2014.

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