Disentangling the effects of internal high-skilled migrations on regional economic performance: the case of Italy

Giulio Castellano[*,1], Gaetano Vecchione[2], and Viktor A. Venhorst[3]

[1,2]Department of Political Science, University of Naples Federico II, Italy
[3]Faculty of Spatial Sciences, University of Groningen, The Netherlands

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Abstract

This work aims to contribute to the growing literature on the consequences of regional skilled migration on the origin regions. More specifically, it aims to investigate the impact of regional skilled migrations in Italy on human capital accumulation and, in the last resort, on economic growth of Southern Italian regions.

Skilled migration reduces the human capital endowment in the origin regions, with a negative effect on labor productivity and, eventually, on economic performance. In addition to this direct effect, skilled migration might also influence economic performance through an indirect (human capital) channel. In fact, migration prospects can influence individual agents' educational choices. In other words, the fact that acquiring tertiary education is associated with a higher probability of migrating modifies the incentive structure behind educational choices.

This transmission mechanism is formalized in a theoretical framework drawn from an existing model for international migrations. To test the existence of the hypothesized mechanisms we build a system of simultaneous equations for GDP per capita, human capital, and enrollment rate. We consider GDP per capita to be a function of human capital and other relevant explanatory variables. Human capital itself is a nested function of enrollment rate and other relevant controls. Finally, enrollment rate is a function of the high skilled migration rate, GDP per capita, and a set of other controls.

Relying on regional data from official statistical sources (ISTAT and Ministry of University and Research) for the period 2002-2023, we build a Structural Equations Model (SEM) to simultaneously estimate the above equations. There are two main reasons behind this choice. Firstly, SEM allows us to better disentangle the direct and indirect effects of high skilled internal migration. Secondly, it allows us to manage the relational loop that links migration, enrollment rate, human capital, and GDP. Thus, SEM allows us to obtain better estimates compared to traditional estimation methods (e.g., regression).

Keywords: Inter-regional skilled migration; Human capital; Italy; Regional development; Structural Equations Modeling.

JEL classification: J61; R23; O15; I25; C38

1 Introduction

Internal migration is a well known phenomenon in the Italian context, and became particularly relevant after the Second World War. Between the Fifties and the Seventies, a large flow of

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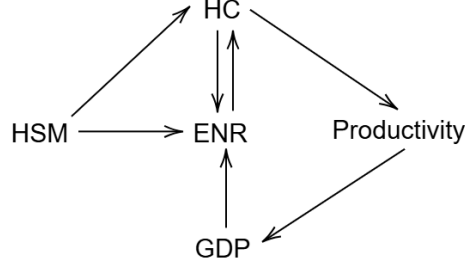[*]Corresponding author. E-mail: `giulio.castellano@unina.it`

Figure 1: Mechanics of high skill migration (HSM) impact on GDP

(unskilled) workers left the rural areas in Southern regions toward the industrialized areas in the North. However, in the last two decades, there has been a significant change in the characteristics of the migrant population. In 2002, 61% of migrants was in possession of at most a middle school diploma (ISCED 2), 29% completed high school (ISCED 3), and only 10% had a university degree. By 2022, the skill composition of the migrant population has radically changed: the lowest-skilled dropped at 30%, those with a high school diploma account for 36% and the share of graduates is 35%.[1]

This relatively swift change in the skill composition of migrants is likely to affect the regional divide between Southern and Northern regions, yet the economic literature on the consequences of this regional 'brain drain' is still limited. This contribution aims to improve the knowledge and understanding of this phenomenon by trying to estimate and disentangle the direct and indirect effects of high-skilled migration on economic growth in Southern Italy. The first one consists in high-skilled migration reducing the human capital level in the origin region(s) (i.e. the share of highly skilled in the population or workforce). This in turns lowers the productivity of labor and negatively affects economic performance. The second one consists in migration prospects affecting the propensity of individuals to invest in human capital (i.e. whether to acquire tertiary education or not). In the case of international migrations, a relevant strand of the literature has proved this effect to be positive, leading to a mitigation of the 'brain drain' hypothesis. However, in the case of internal migration, the sign of this effect is rather unclear, with some empirical evidence of it being negative, at least in the case of Italy (Nifo et al., 2020).

2 Theoretical framework

2.1 Predicting GDP per capita

As in Boeri et al. (2012), the starting point is a GDP equation in the form of a Cobb-Douglas production function. For region i (with $i = S, N$, where S indicates Southern Italy and N indicates Northern Italy), we can express regional GDP at time t as:

$$Y_{i,t} = A_{i,t} K_{i,t}^{1-\alpha_i} E_{i,t}^{\alpha_i} \tag{2.1}$$

where $A_{i,t}$ is the total factor productivity (TFP) of region i in year t, $K_{i,t}$ is the amount of capital in the economy of region i in year t, and α_i is the share of labor in the income of region i.

$E_{i,t}$ is labor expressed in terms of efficiency units, and it is a function of highly skilled ($H_{i,t}$) and low-skilled labor ($L_{i,t}$), with constant elasticity of substitution between the two:

$$E_{i,t}^{\alpha_i} = [q_{i,t}\theta_{i,t}H_{i,t}^{\rho} + (1-\theta_{i,t})L_{i,t}^{\rho}]^{1/\rho} \tag{2.2}$$

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[1]Source: Istat.

where $q_{i,t}$ is the average productivity of educated workers employed in region i in year t (which depends on the quality of education and on the distribution of innate abilities), $\theta_{i,t}$ is the share of highly skilled labor in total labor of region i in year t, ρ is a parameter determining the elasticity of substitution between highly skilled and low-skilled workers, which is given by $1/(1-\rho)$.

The regional return to capital (i.e. the marginal productivity of capital) is equal to the international interest rate plus a regional risk premium. Hence, the following arbitrage condition implicitly defines the equilibrium amount of capital per worker in the regional economies:

$$R^*(1+\phi_{i,t}) = (1-\alpha_i)A_{i,t}K_{i,t}^{-\alpha_i}E_t^{\alpha_i} \tag{2.3}$$

where R^* is the risk-free international interest factor (one plus the interest rate), and $\phi_{i,t}$ captures the risk premium associated to institutional quality (including the extent of transaction costs). The RHS of (2.3) is the partial derivative of $Y_{i,t}$ w.r.t. $K_{i,t}$ (i.e. the marginal productivity of capital).

Substituting (2.3) in (2.1) and dividing by the total population size $(H_{i,t} + L_{i,t})$ gives the following expression for the GDP per capita:

$$y_{i,t} = \left[\frac{1-\alpha_i}{R^*(1+\phi_{i,t})} \right]^{\frac{1-\alpha_i}{\alpha_i}} A_{i,t}^{\frac{1}{\alpha_i}} e_{i,t} \tag{2.4}$$

where $e_{i,t} \equiv E_{i,t}/(H_{i,t} + L_{i,t}) = [q_{i,t}\theta_{i,t}h_{i,t}^{\rho} + (1-\theta_{i,t})(1-h_{i,t})^{\rho}]^{1/\rho}$ measures the average number of efficiency units of workers and $h_{i,t} \equiv H_{i,t}/(H_{i,t} + L_{i,t})$ is the proportion of the highly skilled (with tertiary education) in the resident population. The regional wage differential between highly skilled and low-skilled workers amounts to

$$\frac{w_{i,t}^H}{w_{i,t}^L} = \frac{\theta_{i,t}q_t}{1-\theta_{i,t}} \left(\frac{1-h_{i,t}}{h_{i,t}} \right)^{1-\rho} \tag{2.5}$$

Using (2.4) and taking logs, we can express the GDP per capita in Southern Italy in proportion of the level observed in Northern Italy as

$$\ln\left(\frac{y_{S,t}}{y_{N,t}} \right) = \frac{1}{\alpha_S}\ln\left(\frac{A_{S,t}}{A_{N,t}} \right) + \ln\left(\frac{e_{S,t}}{e_{N,t}} \right) - \frac{1-\alpha_S}{\alpha_S}\ln(1+\phi_{S,t}) \tag{2.6}$$

The log-ratio of the two regions' GDP per capita (i.e. the differential in economic performance between Northern and Southern Italy) is explained by differences in TFP ($A_{i,t}$), in human capital (including educational and average ability of the remaining high-skilled workers), and institutional quality.

High skilled migration has, as a direct consequence, a reduction in human capital accumulation (the share of highly skilled in the workforce of the origin region, $\theta_{S,t}$ reduces). Nevertheless, the literature on international migrations has proven the case for several feedback effects that could contribute to mitigate (or even reverse) the 'brain drain' effect. If so, it could be possible to talk about 'brain gain'.

2.2   The human capital channel

In line with the brain drain literature, Boeri et al. (2012) consider the investment in education to be endogenous and to be affected by two sets of variables:

- *The proportion of highly skilled in the workforce*: theoretically, the wage premium for education is higher if there are fewer graduates (i.e. if the demand for skilled workers is higher than the supply);

- *Migration prospects to developed countries*: as discussed above.

The dynamics of human capital can be considered to be governed by this process:

$$h_{S,t+1} = h_{S,t}(1 - \delta_S) + n(h_{S,t})\Theta_{S,t}(1 - m_{S,t}) \tag{2.7}$$

where δ_S is a rate of depreciation of human capital capturing the level and differential in mortality or retirement of existing cohorts in Southern Italy. The variable $n(h_{S,t})$ captures the growth rate of the labor force or the replacement of old by young workers; it is decreasing in $h_{i,t}$ since more educated parents tend to have fewer children. $\Theta_{S,t}$ reflects enrollment rates in tertiary education and captures the proportion of educated within the new cohort of workers. Finally, $m_{S,t}$ is the emigration rate of young educated adults.

The steady state, if it exists, is the following:

$$h_S^* = \frac{n(h_S^*)\Theta_S^*(1 - m_S^*)}{\delta_S} \tag{2.8}$$

Now we endogenize $\Theta_{S,t}$, that is the investment in education (human capital) in Southern Italy. As previously said, it depends on the share of high skilled ($h_{S,t}$), on the proportion of $h_{S,t}$ employed in the production of human capital ($\hat{h}_{S,t}$), and on migration prospects. The magnitude of the latter depends on the high-skilled wage gap between Southern and Northern Italy, $[1 - (w_{S,t}^H/w_{N,t}^H)]$. Therefore, we have

$$\Theta_{S,t} = \Theta\left[h_{S,t}, \hat{h}_{S,t}, m_{S,t}\left(1 - \frac{w_{S,t}^H}{w_{N,t}^H}\right)\right] \tag{2.9}$$

Plugging (2.9) into (2.7) and deriving $h_{S,t+1}$ w.r.t. $m_{S,t}$, a marginal increase in $m_{S,t}$ stimulates human capital accumulation if and only if

$$\Theta_3'(1 - m_{S,t})\left(1 - \frac{w_{S,t}^H}{w_{N,t}^H}\right) > \Theta_{S,t} \tag{2.10}$$

where Θ_3' is the partial derivative of $\Theta_{S,t}$ w.r.t. $(m_{S,t}[1 - (w_{S,t}^H/w_{N,t}^H)])$.[2]

For condition (2.10) to hold, the emigration rate ($m_{i,t}$) must not be too high, the wage differential must be large enough (i.e. $w_{S,t}^H/w_{N,t}^H$ must be small), and Θ_3' must be large.

In the literature on international brain gain, the prospect of migrating to a richer country could act as an incentive to invest more in human capital for people living in developing countries. Thus, in addition to the direct negative effect of skilled migration on human capital, there is this possible feedback effect through which skilled migration can stimulate human capital accumulation. In our model, this translates to the function Θ having positive partial derivatives ($\Theta_1', \Theta_2', \Theta_3' > 0$).

With reference to the internal migrations in Italy, the existence of this education incentive generated by skilled out-migration seems unrealistic for at least two reasons. In first place, international migration flows are heavily influenced by the immigration policies of receiving countries, while regional migrations take place within a single country, where citizens can move without legal constraints. In second place, the differences between Northern and Southern regions in terms of economic performance, quality of life, opportunities, and institutional quality are rather limited compared to the differences between developing and developed countries. Therefore, in the case of internal migrations in Italy, the incentive effect of migration prospects on investment in human capital is unlikely to take place. Moreover, there is some empirical evidence about the existence of a reverse effect, according to which internal migration prospects play as a disincentive to invest in education (Nifo et al., 2020).

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[2]Similarly, Θ_1' and Θ_2' are the partial derivatives of $\Theta_{S,t}$ w.r.t. $h_{S,t}$ and $\hat{h}_{S,t}$, respectively.

Since $\Theta_{S,t}$ is greater than zero (enrollment rates cannot be negative), a necessary but not sufficient condition for (2.10) to hold is that its LHS must be greater than zero. The term $(1-m_{S,t})$ is necessarily greater than (or equal to) zero because $0 < m_{S,t} < 1$. So, for the condition (2.10) to be satisfied, Θ_3' and $[1-(w_{S,t}^H/w_{N,t}^H)]$ must be either both positive or both negative. Since we are assuming that in the Italian case the former is negative, then the latter must be negative too. But this would be possible only if the wage ratio were greater than one (i.e. if high-skilled wages were higher in the South Italy than in the North), which is not the case. Therefore, in the Italian scenario the condition (2.10) for a brain gain through the human capital channel is not met, and the feedback effect of skilled migration on human capital accumulation contributes to magnify the human capital loss driven by the direct effect.

3 Empirical analysis

3.1 Methodology and data

The theoretical framework outlined in the previous section features some complex interactions between variables, which are affected by skilled migration through several direct and indirect channels. In order to take into account those interactions we adopt a SEM strategy that allows us to simultaneously estimate the equations of interest. In this way it is possible to disentangle the direct and indirect effects of skilled migration on economic growth.

The two main data sources are Istat (Italian Istitute of Statistics) and Mur (Ministry of University and Research). Istat provides high-quality, reliable data on demographic and economic statistics (GDP, unemployment rates, wages, productivity). Mur, instead, provides detailed data on university fees, enrollment rates, and other universiy-related measures. We use regional-level data for the period 2002-2023.

3.2 Estimation

We build a regression model for the log of GDP per capita:

$$\ln(GDPpc_{i,t}) = \alpha_0 + \alpha_1 ENR_{i,t-5} + (\alpha_2 HSM_{i,t}) + \alpha_3 \boldsymbol{X} + \varepsilon \tag{3.1}$$

A second one for human capital:

$$HC_{i,t} = \beta_0 + \beta_1 ENR_{i,t-8}(1-\delta) + \beta_2 \boldsymbol{W} + \nu \tag{3.2}$$

And another one for the enrollment rate:

$$ENR_{i,t-5} = \gamma_0 + \gamma_1 HSM_{i,t-5} + \gamma_3 \boldsymbol{Z} + \xi \tag{3.3}$$

where the sets of controls $\boldsymbol{X}, \boldsymbol{W}, \boldsymbol{Z}$ share some variables.

SEM allows us to solve this system of simultaneous equations. The exact estimation method is still to be defined.

3.3 Expected results

Following theoretical intuition and empirical evidence, we expect both the direct and indirect effect of skilled migration on economic growth to be negative. Observing the size of the two effects on economic growth could lead to a better understanding of the consequences of skilled migration.

The main innovation of this contribution is the use of SEM to estimate the economic impact of skilled migrations in the origin regions.

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