Medical Brain Drain and Life Expectancy: A Comparative Analysis between Arab, American and Asian Countries

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- Life expectancy function is applied.
- Fixed and random effects approaches are employed.
- Policy recommendations have been provided.

Abstract
Purpose: *In this paper we use the most recent database on medical brain drain (estimated by Bhargava, Docquier and Moullon in 2010) in order to analyze the consequences ofincreasing medical migration flowson human development, in particular on life expectancy in three developing country groups.* ***Methodology:*** *Our aim is to study the quantitative and qualitative effect of medical brain drain (MBD) on life expectancy in the Arab, Asian and American countries.* ***Findings:*** *The results showed that the MBD has an important and significant quantitative effect on life expectancy in Arab and Asian countries. Indeed, the elasticity of life expectancy with respect (1+MBD) is positive and significant at 1% level in all regressions for the two groups. Nevertheless, this relationship is not clear for central and Latin American countries where elasticity is not significant in two among three regressions. Moreover, the qualitative MBD effect is negative for all countries in the three groups.* ***Recommendations:*** *Therefore, there is a need for the majority of these countries to change both their labor and emigration policies. This can be achieved by a veritable incentive policy and by reinforcing networks between emigrant physicians and their origin society.*

Keywords: Brain Drain, Human Capital, Development
JEL Classifications: F22, J24, O15

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I. Introduction

Several studies have been conducted in the framework of new brain drain literature over about the two latest decades. It is also true that the majority of works argue that the brain drain can generate through emigration prospects a brain gain (Stark and Wang 2002, Beine et al. 2001 and 2008, Beine et al. 2011, Docquier and Rapoport 2004, 2007, Docquier and Rapoport 2012, Bhargava et al. 2011, Kouni 2016a, Eljafari et al. 2012). Nevertheless, some other works showed that this gain is relatively small and it cannot permit to recuperate the brain loss, particularly in the case where the emigration rate is high (Bhargava and Docquier 2008, Schiff 2005). It is clear that until the moment, these studies have not attained the consensus. Indeed, the most recent studies showed that there are two opposite effects (both positive and negative) exerted by the brain drain on different development variables. For example, Docquier and Rapoport (2012) argued that skilled emigration permits to create both winners and losers in source countries.

Further, it is important to stress that if there are many studies conducted on skilled emigrant workers, just a little works that studied the impact of specific skills such as medical skills. For example, Bhargava and Docquier (2008) analyzed the effect of medical brain drain (MBD) on life expectancy and showed that there is not a significant relationship. Bhargava et al. (2011) argued that in spite of MBD has a positive and significant effect on medical human capital investment, it does not cease to increase infant mortality. Kouni (2016 b) showed that the MBD has a positive and significant effect on both human capital and GDP per capita for the countries of the Arab Maghreb, but it remains small in order to register a net brain gain.It is in this perspective that this paper proposes to analyze the impact of medical brain drain on life expectancy in three country groups, namely the Arab, Asian and American countries.

This paper contributes to the literature in this field from some points. First, there is a small number of works that studied the effect of medical brain drain on human development. Moreover, the effect of MBD on life expectancy remains a subject not studied enough. Second, there is a little of works which have realized a comparison between developing country groups at this level. Third, the paper investigated the quantitative and qualitative effects of MBD on life expectancy. The qualitative effect is appreciated by an interactive variable between the MBD and the number of physicians per 1000 people. To the best of my knowledge there is no another study that have distinguished between the two effects. The empirical results prove, consistent with the new brain drain literature, that medical brain drain has an important and significant quantitative effect on life expectancy in Arab and Asian countries. However, this relationship is not confirmed for Central and Latin American countries. In the same way, the qualitative effect is negative and significant for all country groups. This means that MBD reduces life expectancy in the long run and new physicians aroused by emigration are incapable to recover the same quality of health services in these countries.

II. Literature Review

The main idea of the new brain drain and brain gain literature shows that in presence of large income differences between host and home countries, emigration prospects arouse individuals to invest in education in order to achieve their emigration project. Therefore, the number of skilled workers increased and this permits to increase the share of educated and accelerating the accumulation of human capital, which amounts to a brain gain. Docquier and Rapoport (2004, 2007) conclude that the optimal emigration rate of highly educated workers is likely to be positive. The fact of whether an observed rate is above or below the optimal rate is an empirical issue that can be treated in each country apart. Beine et al. (2001) studied the impact of brain drain on human capital investment and growth for 37 developing countries. The authors show that there is a positive indirect effect of skilled emigration on human capital investment, consistent with the result of the work of Beine et al. (2008). Indeed, using a cross-sectional database largest than the one used in 2001, the authors have found that the emigration prospects generate a significant positive effect on gross human capital investment. Beine et al. (2011) show, by using for the first time a panel data model, that the brain drain has a positive effect on education, only for low-income countries where emigration probability is relatively low. Nevertheless, for low-income countries where emigration rate is above 30% brain drain has negative effect. In countries with medium or high income, the skilled emigration does not have a significant impact. Bhargava et al. (2011) conduct a panel analysis of 69 developing countries on 4 periods of 3 years from 1991 to 2004, and they show that medical brain drain contributes positively and significantly to the number of trained physicians. However, migration reduces the number of doctors in these countries and contributes to the increase in infant mortality.Nonetheless, in contrast with this new trend, Schiff (2005) proves that the brain gain shown by this new literature is significantly small. Ali (2015) mentions that remittances play important role in reducing child mortality. The author shows that there are several factors that can reduce significantly the brain gain. For example the uncertainty reduces the expected return of human capital. Indeed, there are several uncertainty sources, among which success degree, the future employment abroad, the immigration policies adopted by the host countries, the education cost, etc.of 39 developing countries, Lucas (2005) confirms that the brain drain has a negative effect on human capital.

Ali and Khalil (2014) study the impact of socio-economic factor on life expectancy in Oman. Ali and Audi (2016) examine the impact of income inequality, environmental degradation and globalization on life expectancy in case of Pakistan. Hence, Docquier and Machado (2015) conclude that the emigration prospects encourage education in developing countries, but this effect remains small to generate a net brain gain. Docquier and Rapoport (2012) showed that the emigration prospects can generate both winners and losers in developing countries. The net brain gain depends on some characteristics related to source countries such as governance and institutions quality, technology and demographic size. Marchiori et al. (2013) suggest that the short-run brain drain effect on native human capital is critical, because it affects not only the number of educated workers but also the innovation capacity in the source countries.

III.Empirical Modelling

Following the work of Bhargava and Docquier (2008) and Bhargava et al. (2011), and based on data set estimated by the latest authors in 2010, the empirical model specified for life expectancy (as a human development indicator) can be written as follows:

$$\ln life\exp ec\tan cy_{i,t} = c_0 + c_1(\ln Phys1000))_{i,t} + c_2(\ln(1+MBD))_{i,t} + c_3(\ln Phys1000)_{i,t} \times (\ln(1+MBD))_{i,t} + c_4(\ln gdp\_capita)_{i,t} + c_5(\ln \mathrm{Re}mit\_capita)_{i,t} + \varepsilon_{i,t} \quad (1)$$

i = 1,… ,N countries.
t = 1991,… ,2004.

With *lnlifeexpectancy*, *Lnphys1000*,*Ln(1+MBD)*,*lnphys1000*Ln(1+MBD)*, *Ln_gdp_capita*, *Ln Remit_capita* and ε are respectively the life expectancy, the number of physicians per 1000 people, the medical brain drain rate with one added, the interactive variable which measures the combined effect of MBD through physicians number (per 1000 people), the gross domestic product per capita,theremittances per capita and error term. Moreover, all variables are under their logarithmic form.

Dependent variable:

The life expectancy is among the three components of human development indicator (HDI) measured and published by UNDP since 1990. Indeed, HDI is defined as a mean of three indices such as life expectancy, education and per capita GNI. In the recent changes conducted on this indicator (in 2010), UNDP measured HDI as a geometric mean of these three indices which represent three cotes of human triangle (health, education and income). The following function shows how HDI measured:

$$HDI = (I_{lifeexpect})^{1/3} \times (I_{education})^{1/3} \times (I_{GNI})^{1/3} \quad (2)$$

It is clear that all weighting coefficients are equal to 1/3. This means that health, education and income have all the same importance in human development. For this, and for the unavailable annual data on HDI over the period of 1991-2004, we choice to study the MBD effect on life expectancy. It is evident that life expectancy is a health indicator, but also MBD affects human development through health because it reduces the physicians' number in the economy and it can generate a positive effect in long term through emigration prospects (as proven by the new brain drain literature). This is among our motivations to analyze this impact which could not have been sufficiently studied in the recent years. But, to attain a global result of MBD on health for an economy, it is essential to test its impact on a global indicator such as life expectancy. The works of Bhargava et al. (2011) and Bhargava and Docquier (2008) are among small number of studies that analyzed the MBD effect on some health variables such as infant mortality, vaccination rates, life expectancy and death to due AIDS.

Independent variables:

- Lnphys1000: The number of physicians per 1000 people. It constitutes among the variables which generate a direct effect on life expectancy. Therefore, the expected sign of c1 is positive.
- Ln(1+MBD): The medical brain drain rate with one added. The MBD is taken this form in order to eliminate the discontinuity at the level of zero values. Bhargava et al. showed that the similar result can be obtained if the variable is considered in level. The sign of this variable can be positive or negative. The new brain drain literature showed that the emigration can generate a positive impact on human capital and income levels (Docquier and Rapoport (2004, 2007), Beine et al. (2001, 2008)). However, some other works invalidate this result (Lucas (2005), Schiff (2005). Insofar as emigration of physicians constitutes an important loss for health sector, it can be considered as a detrimental factor for life expectancy (c2 < 0). But, if MBD can generate an important quantitative gain (the gain is the number of new physicians aroused by emigration and cannot effectively emigrate) the sign of its coefficient (c2) is positive.

- lnphys1000*Ln(1+MBD): An interactive variable which measures the combined effect of MBD and physicians number (per 1000 people). Its sign can be positive or negative. This depends of the effect generated by MBD.

Assumption: *It is essential to stress that we can consider that the first migration variable (Ln(1+MBD)) generates a quantitative effect . The mechanism as showed by several studies conducted in the framework of new brain drain literature is as follows:*

$$\begin{aligned} MBD &\rightarrow \text{Emigration prospects} \\ &\rightarrow \text{individuals aroused by emigration invest in medical education} \\ &\rightarrow \text{the main part of physicians cannot emigrate (selective policy)} \\ &\rightarrow \text{the economy registers new doctors} \rightarrow \text{medical brain gain} \end{aligned}$$

- *However, the interactive variable can exert a* ***qualitative effect****. It is evident in fact that the number of physicians per 1000 people reflects the health sector quality in the economy. As and when the number of physicians per 1000 people increases the health quality is improving.*
- Ln_gdp_capita: The GDP per capita in constant dollar (in 2000). Its sign is positive.
- Ln Remit_capita: The per capita remittances. As among important income sources, remittances play an important role in boosting human development (human capital and income), and specially health through consumption. Therefore, its expected sign is positive.

Data:

Data draw from two main sources: World Development Indicators (World Bank) (noted in the text by WDI) and Bhargava et al. (2010) database (noted in the text by BDM database). Following table summarize the definitions and sources of variables:

Table-1. Data Definitions and Sources

Variable	Définition	Source
LN (LIFEexpectancy)i,t	Life expectancy measured as being the number of expected years at birth	WDI, World Bank
$(\ln Phys1000)_{i,t}$	The number of physicians per 1000 people	BDM database (2010)
$(\ln(1+MBD))_{i,t}$	The medical brain drain rate with one added MBD is defined as follows: $MBD = \frac{emigrant\ physicians}{resident+emigrant\ physicians}$	BDM database (2010)
$(\ln Phys1000)_{i,t} \times (\ln(1+MBD))_{i,t}$	Interactive variable which measures the combined effect of MBD and physicians number (per 1000 people)	BDM database (2010)
$(\ln gdp\_capita)_{i,t}$	GDP per capita in constant dollar (in 2000)	WDI, World Bank
$(\ln Remit\_capita)_{i,t}$	Remittances per capita was calculated as follows: $Remit\_capita = \frac{Remittances}{Population}$	WDI, World Bank

It is important to stress that data on skilled emigration are not regularly collected and exist only for few years. Main data exist in some attempts of estimates realized by some authors among which we can cite the databases of Carringhton and Detragiach (1998), Docquier and Marfouk (2006), Deefoort (2008) and Bhargava et al. (2010). Indeed, the latest database has estimated the number of emigrant and resident physicians from developing countries towards 18 receiving countries over the period 1991-2004.The sample comprises 9 Arab countries, 14 Asian countries and 20 Central and Latin American countries.

IV. Methodology

Our methodological approach consists to estimate equation (1) by three methods. First we estimate fixed effects model. Second we estimate random effects generalized least squares (GLS) model. As Bhargava and Docquier (2008) we assume that the random effects are correlated with explanatory variables such as lnphys1000 (presence of heteroskedasticity). Further, Baltagi and Wu (1999) showed that in the case where the data set is collected over unequally spaced time intervals the GLS method is recommended. It is also possible thatthe disturbance term whether first-order autoregressive (AR(1)). For this, we estimate also a random effects GLS model with AR(1) disturbances.

V. Empirical Results

The model is statistically significant in all regressions for the three groups (chi2 (or F statistic) is high and significant at 1% level in all regressions). Moreover, MBD exerts an important and significant effect on life expectancy relatively in the majority of regressions. Indeed, as proven by the new brain drain literature physicians' emigration has a positive and significant quantitative effect on life expectancy in Arab and Asian countries. This impact is relatively greatest in Arab countries than in Asian countries for the reason that the emigration is higher in average in the second group (Table-2). The elasticity of life expectancy with respect (1+MBD) is positive and significant at 1% level in all regressions for the two groups. Nevertheless, this effect is not clear for central and Latin American countries where elasticity is not significant in two among three regressions. This can be explained by the highest levels of medical emigration in some American countries such as Jamaica, St. Lucia, Dominican Republic and Grenada. For two first groups (Arab and Asian countries) the physicians' emigration prospects arouse individuals to invest in medical education in order to emigrate. But, just a part that emigrates.

Table-2. Results of Effect of MBD on Life Expectancy in Arab Countries

Variables	**Fixed effects model (FE)**		**Random effects-Generalized Least Squares model (GLS-RE)**		**Generalized Least Squares model *with* AR(1) disturbances(GLS-AR)**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Constant	3.2409***	3.1004***	3.3130***	3.1926***	3.7016***	3.6536***
	(36.11)	(32.38)	(34.86)	(33.81)	(44.61)	(44.27)
Lnphys1000	.0687***	.0603***	.0631***	.0619***	.0301***	.0266***
	(10.16)	(7.45)	(8.87)	(7.65)	(5.20)	(4.61)
Ln(1+MBD)	.5128***	-	.4121***	-	.2171***	-
	(6.81)		(5.28)		(2.84)	
lnphys1000*Ln(1+MBD)	-	-.2125***	-	-.2182***	-	-.0752**
Ln_gdp_capita		(-3.98)		(-4.06)		(-2.02)
	.1352***	.1584***	.1254***	.1452***	.0673***	.0761***
Ln_Remit_capita	(10.43)	(11.57)	(9.29)	(10.96)	(5.75)	(6.63)
	-.0076***	-.0046**	-.0064***	-.0041**	.0007	.0011
	(-4.00)	(-2.25)	(-3.11)	(-1.97)	(0.49)	(0.78)
F statistic	180.93	140.83	-	-	-	-
Prob>F	0.0000	0.0000	-	-	-	-
Wald chi2	-	-	591.79	537.23	128.34	118.57
Prob>chi2	-	-	0.0000	0.0000	0.0000	0.0000
N. of observations	126	126	126	126	126	126
N. of countries	9	9	9	9	9	9

Note: t-statistic in parentheses; ***, **, *: significant at 1%, 5% and 10% respectively.

and the majority of new trained physicians remain in their origin countries. Therefore, MBD boosts the human capital level in medical sector. Consequently, the quantity of health services are improving, which improves life expectancy. This result is consistent with several works conducted in framework of new brain drain literature, such as works of Beine et al. (2001, 2008), Beine et al. (2011), Docquier and Rapoport (2004, 2007), Docquier and Machado (2015) and Kouni (2016 a, b) However, if emigration rate is high this effect becomes more and more weak or negative. Nevertheless, the interactive variable has a negative effect on life expectancy. The elasticity of life expectancy with respect to lnphys1000*Ln(1+MBD) is significant at 1-5% level in all regressions, except the GLS-AR regression for Central and Latin American countries. This shows that the qualitative MBD effect is negative for all countries in the three groups. It is true that in presence of very selective emigration policies, MBD does not cease to cause a significant qualitative loss, whose new medical skills are incapable to recover the same quality of health services that previously.

Table-3. Results of Effect of MBD on Life Expectancy in Asian countries

Variables	Fixed effects model (FE)		Random effects-Generalized Least Squares model (GLS-RE)		Generalized Least Squares model *with AR(1) disturbances* (GLS-*AR*)	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	3.8573***	3.8720***	3.8396***	3.8449***	3.9251***	3.9302***
	(62.05)	(60.77)	(67.30)	(67.91)	(95.37)	(94.18)
Lnphys1000	.0783***	.0604***	.0362***	.0347***	.0193***	.0180***
	(5.45)	(5.00)	(4.36)	(4.46)	(3.34)	(3.05)
Ln(1+MBD)	.4362***	-	.1716***	-	.1129***	-
	(4.72)		(3.09)		(2.86)	
lnphys1000*Ln(1+MBD)	-	-.1026***	-	-.0534***	-	-.0322**
Ln_gdp_capita		(-4.15)		(-3.13)		(-2.55)
	.0451***	.0460***	.0483***	.0489***	.0374***	.0376***
Ln Remit_capita	(4.70)	(4.74)	(5.61)	(5.77)	(6.24)	(6.25)
	.0139***	.0144***	.0137***	.0141***	.0065***	.0067***
	(7.19)	(7.34)	(7.21)	(7.39)	(4.70)	(4.83)
F statistic	54.24	51.73	-	-	-	-
Prob>F	0.0000	0.0000	-	-	-	-
Wald chi2	-	-	213.76	215.27	97.42	94.26
Prob>chi2	-	-	0.0000	0.0000	0.0000	0.0000
N. of observations	196	196	196	196	196	196
N. of countries	14	14	14	14	14	14

Note: t-statistic in parentheses; ***, **, *: significant at 1%, 5% and 10% respectively.

Table-4. Results of Effect of MBD on Life Expectancy in Central and Latin American Countries

Variables	Fixed effects model (FE)		Random effects-Generalized Least Squares model (GLS-RE)		Generalized Least Squares model *with* AR(1) disturbances (GLS-AR)	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	3.5663***	3.6106***	3.6602***	3.7000***	3.8131***	3.8117***
	(53.09)	(54.85)	(67.36)	(69.88)	(75.86)	(76.44)
Lnphys1000	.0235***	.0288***	.0160***	.0290***	.0103***	.0108***
	(4.14)	(5.46)	(3.24)	(5.57)	(2.74)	(2.81)
Ln(1+MBD)	.1635***	-	.0320	-	.0391	-
	(2.75)		(0.85)		(1.24)	
lnphys1000*Ln(1+MBD)	-	-.1067***	-	-.0979***	-	-.0209
Ln_gdp_capita		(-4.58)		(-4.33)		(-1.36)
	.0819***	.0783***	.0717***	.0666***	.0541***	.0548***
Ln Remit_capita	(9.24)	(9.01)	(9.97)	(9.64)	(8.23)	(8.53)
	.0081***	.0082***	.0085***	.0086***	.0023***	.0024***
	(8.61)	(8.99)	(9.58)	(9.94)	(3.88)	(4.02)
F statistic	106.52	115.21	-	-	-	-
Prob>F	0.0000	0.0000	-	-	-	-
Wald chi2	-	-	455.77	503.66	121.37	123.20
Prob>chi2	-	-	0.0000	0.0000	0.0000	0.0000
N. of observations	280	280	280	280	280	280
N. of countries	20	20	20	20	20	20

Note: t-statistic in parentheses; ***, **, *: significant at 1%, 5% and 10% respectively.

Bhargava and Docquier (2008) showed that this relationship is not significant in the case of Sub-Saharan Africa. Further, Bhargava et al. (2011) proved that there is a negative effect of MBD on infant mortality. Furthermore, the number of physicians per 1000 people and GDP per capita contribute positively and significantly to improving life expectancy. Indeed, for three groups the elasticity of life expectancy with respect to two variables is positive and significant at 1% level in all regressions. This means that the health quality and per capita income constitute the main factors of life expectancy. But also, reducing one of these factors, this signifies the reduction of life expectancy (Table-3).

For this, if physicians' emigration has not created an important medical brain gain in such a way that it permits to improve significantly life expectancy, its effect becomes negative. However, remittances do not affect life expectancy in the same way for all groups (Table-4). Hence, the elasticity of life expectancy with respect remittances is significant at 1% level in Asian and American countries in all regressions. But, it is relatively small where it varies from 0.0023 to 0.0086 for Asian countries and from 0.0065 to 0.0144 for Central and Latin American countries. This means that remittances can play an important role in improving health if a considerable amount is allocated to health expenditures. But, remittances have a significant negative impact on life expectancy for Arab countries in 4 among 6 regressions. This unexpected sign can be argued by the biased allocution of remittances where the main amount of send money is allocated to consumption than to physical and human investment. The same result is obtained by some other works that have studied the effect of remittances on different growth variables such as Barajas et al. (2009) and Ahoure (2008) for example. While the BDM database is among latest skilled emigration database estimated in 2010 and first annual continuous data set over relatively long period (from 1991 to 2004), a serious recently effort of data collecting about skilled emigrants, in particular medical brain drain can better show this effect on human development variables.

VI. Conclusion and Policy Implications

This study uses a recent database on medical brain drain (estimated by Bhargava et al.(2010) to show how emigration prospects can affect human development, in particular life expectancy in some developing countries. Our purpose consists to study the quantitative and qualitative effect of MBD on life expectancy in three country groups: Arab, Asian and Central and Latin American countries. The results showed that MBD generates, consistent with the new brain drain literature, an important and significant quantitative effect on life expectancy relatively in the majority of regressions of Arab and Asian countries. This effect is relatively greatest in Arab countries than in Asian countries for the reason that the emigration is higher in average in the second group. The elasticity of life expectancy with respect (1+MBD) is positive and significant at 1% level in all regressions for the two groups. Nevertheless, this effect is mitigated for central and Latin American countries where elasticity is not significant in two among three regressions. This can be argued by the highest levels of medical emigration rate in some American countries.

However, the interactive variable has a negative effect on life expectancy. The elasticity of life expectancy with respect to lnphys1000*Ln(1+MBD) is significant at 1-5% level in about all regressions. This shows that the qualitative MBD effect is negative for all countries in the three groups. It is true that in presence of very selective emigration policies, MBD does not cease to cause a significant qualitative loss whose new medical skills are incapable to recover the same quality of health services, even if it creates a great brain gain. On the other hand, the number of physicians per 1000 people and GDP per capita constitute the main contributors to life expectancy improvement in the three groups. Nevertheless remittances cannot have had the same effect in all groups. Indeed, remittances generate a significant and positive, but small effect for Asian and American countries and a significant and negative impact for Arab countries.At the end of this analysis it comes out that there is a need for these country groups to adopt some emigration policies:

- There is a need for some Latin and Asian countries, where emigration rate is high, to adopt an incentive policy to encourage high skills, particularly medical skills, to remain in their origin countries. This can be attained by both material and moral incentives (salary, prizes, supporting travels, supporting health expenditures, and several other favors).
- Policy-makers should reinforce networks between emigrant physicians and health institutions (hospitals, health research centers...) in order to ameliorate health quality in these countries. Some measures can be adopted such as supporting travel and accommodation fees of emigrant doctors invited to hospitals, universities and search centers and laboratories, the organization of specific meetings between emigrant physicians and their homologues, and encouraging them in order to have permanent relations with their origin society.
- It is very important to reorient the main amount of remittances to health expenditures and human capital investment in all countries considered in the sample, especially in the Arab countries. Remittances can boost significantly the health quality and contribute to improve life expectancy.

Finally, an important direction for future research is to try to better collect and estimate fine data on emigrants and better valorize the real brain gain through for example the comparison between the domestic incentives and the one coming from emigration prospects.

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Appendices

A1. Country list

Arab countries: Algeria, Egypt, Jordon, Lebanon, Morocco, Sudan, Syrian Arab Republic, Tunisia and Yemen.

Asian countries: Armenia, Azerbaijan, Bangladesh, China, India, Indonesia, Iran, Kazakhstan, Malaysia, Nepal, Pakistan, Philippines, Sri Lanka and Thailand.

Central and Latin American countries: Argentina, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, Dominican Republic, El Salvador, Grenada, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, St Lucia, Suriname and Venezuela.

A2. Descriptive statistics:

1. **Descriptive statistics: Central and Latin American countries:**

Variable		Mean	Std. Dev.	Min	Max	Observations	
ln_lif~t	overall	4.243166	.0683611	4.009013	4.361857	N =	280
	between		.067355	4.034268	4.347126	n =	20
	within		.0186532	4.189376	4.289322	T =	14
ln_gdp~a	overall	7.686054	.7865085	5.222851	9.013206	N =	280
	between		.7997695	5.53756	8.894394	n =	20
	within		.0936379	7.371346	8.060667	T =	14
ln_phy~0	overall	-.047136	.647047	-2.26529	1.10176	N =	280
	between		.6277163	-1.870996	1.043896	n =	20
	within		.2073688	-.6303217	.6098398	T =	14
ln_rem~a	overall	3.253406	1.942562	-2.399848	6.536949	N =	280
	between		1.755798	-.8261976	5.788076	n =	20
	within		.913436	.6836349	6.171663	T =	14
ln1mbd	overall	.1323098	.1865101	.00595	.68801	N =	280
	between		.1901067	.0074714	.6829264	n =	20
	within		.01815	.0319876	.2103576	T =	14
ln_1mb~0	overall	-.0426806	.1388788	-.5013674	.1813687	N =	280
	between		.1353497	-.4506084	.1293093	n =	20
	within		.0426776	-.2952435	.1377761	T =	14

2. **Descriptive statistics: Asian countries:**

Variable		Mean	Std. Dev.	Min	Max	Observations	
ln_lif~t	overall	4.192068	.0685672	3.999584	4.296793	N =	196
	between		.0649998	4.083543	4.2762	n =	14
	within		.0275347	4.105928	4.274277	T =	14
ln_gdp~a	overall	6.668714	.7399897	5.211757	8.402581	N =	196
	between		.7446045	5.347874	8.211423	n =	14
	within		.1735262	6.057323	7.241685	T =	14
ln_phy~0	overall	-.5335462	1.270033	-3.23145	1.36805	N =	196
	between		1.258585	-2.974571	1.313949	n =	14
	within		.3668124	-2.090132	.346908	T =	14
ln_rem~a	overall	2.356708	1.363617	-2.809229	4.957331	N =	196
	between		1.120787	.373381	4.315218	n =	14
	within		.8288749	-.8259013	5.30267	T =	14
ln1mbd	overall	.0981537	.1223832	.00066	.54199	N =	196
	between		.1124349	.0016486	.3713257	n =	14
	within		.0563812	-.0408998	.3420301	T =	14
ln_1mb~0	overall	-.108256	.2313045	-1.204268	.0358361	N =	196
	between		.1537855	-.4969394	.0190583	n =	14
	within		.1772807	-.9057976	.3343064	T =	14

3. Descriptive statistics: Arab countries

Variable		Mean	Std. Dev.	Min	Max	Observations	
ln_lif~t	overall	4.195706	.092603	3.968571	4.295845	N =	126
	between		.094951	4.010014	4.275723	n =	9
	within		.0222994	4.14084	4.247389	T =	14
ln_gdp~a	overall	7.140161	.7344596	5.610671	8.538905	N =	126
	between		.7699753	5.79341	8.426278	n =	9
	within		.0907008	6.943626	7.368242	T =	14
ln_phy~0	overall	-.338707	1.004197	-2.40795	1.1794	N =	126
	between		1.036331	-2.117421	.8458236	n =	9
	within		.2147646	-1.012314	-.0051306	T =	14
ln_rem~a	overall	4.262579	1.202482	.5793718	7.125432	N =	126
	between		1.172858	2.4874	6.163662	n =	9
	within		.4619829	2.354551	5.508602	T =	14
ln1mbd	overall	.0879963	.0689136	.00938	.27925	N =	126
	between		.0709866	.0132479	.2063571	n =	9
	within		.0152985	.0486392	.1608892	T =	14
ln_1mb~0	overall	-.0214319	.1380966	-.4827686	.2070902	N =	126
	between		.1428446	-.364401	.1642748	n =	9
	within		.0280744	-.1397994	.0398539	T =	14