

## **Public education expenditures and intergenerational income mobility: a logit model**

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**Abstract:** *Using data from the National Survey of Living Standards of Households in Morocco conducted in 2007 (NSLSHM 2007), we show that intergenerational income mobility (IIM) in Morocco is lower compared to that recorded in industrialized countries, namely, USA, Great Britain and Germany. We also show that education plays a minor role in comparison with the role it plays in the industrialized countries in the process of income mobility, mainly because of its low efficiency. In addition, secondary education contributes negatively to mobility. The robustness of these results is supported by both the models borrowed from the literature and our logit model. Other factors such as activity sector and area of residence are also analyzed.*

**Keywords:** *Public education expenditures- intergenerational income mobility - National survey on the living standards of households - logit model - Morocco.*

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### **I. Introduction**

Intergenerational social mobility has long been exclusively investigated by sociologists. They tried to answer questions such as: What factors explain the persistence of social status across generations? Are meritocratic societies more egalitarian or at least coherent when they encourage incentives for effort and fulfillment? etc. The latter issue has a direct bearing on problems of efficiency and effectiveness. As we know, efficiency and effectiveness are so important to economists that they immediately took up the issue of mobility.

From a purely economic point of view, strong mobility is beneficial in several respects: It promotes social cohesion from the moment everyone can climb the social ladder on the basis of his own efforts. This implies that social origin is not important and that equal opportunities tend to be promoted. Moreover, this flexibility promotes the efficiency and effectiveness of the economy as a whole by encouraging individuals to make greater efforts and to exploit their full potential. Ultimately, in societies with high social mobility, it is the economy as a whole that wins by reaching its full potential. These last considerations have led economists to take an interest in the problem of Intergenerational Income Mobility (IIM). By IIM we mean the change or elasticity of the income of the generation of children compared to that of their fathers. Henceforward, we designate it by mobility for short.

In this paper, we analyze a set of factors, including education, likely to influence mobility in Morocco. The results are compared with those already found in industrialized countries such as USA, Great Britain and Germany. This will enable us to identify patterns for these industrialized countries and a developing country such as Morocco. In order to ensure the robustness of the results, we adopted two models: a model borrowed from the literature and our logistic regression model.

### **II. Literature review**

Since the pioneering work of Gary Becker (Becker, 1964), economists have focused on education as an engine of growth through innovation and qualification (Philippe Aghion, Howitt, & García- Peñalosa, 1998). Recently, interest is also focused on a particular aspect of education: its impact on the IIM or the extent to which education gives individuals access to a higher or lower economic status than that of their parents. These studies are both theoretical and empirical. Empirical studies have been developed through improved methods of measurement and availability of data on father-son couples.

As mentioned earlier, Becker was among the first to be interested in the economics of education and its role in mobility. In their study, Becker and Tomes show that in the case of a perfect capital market, the incomes of the father and the son would be linked through the transmission of all kinds of heritages, while investment in the human capital of the children does not play a major role in this process. The pattern is completely different in the absence of a perfect capital market. Parents who do not have access to the credit market cannot allocate their permanent income optimally between their immediate consumption and investment in the accumulation of their children's human capital. Therefore, the incomes of father and son are also linked through

education. Consequently, the education policy has a role to play in promoting the IIM by weakening the impact of transmission through investment in human capital (Becker & Tomes, 1986).

From the model of Becker and Tomes, much work has been developed. Thus, under the assumption of a complementarity between public and private education, Solon (2007) presents the IIM in terms of parental investment and state investment in the human capital of the child. According to his study, a country has a lower IIM than other countries if heritability in it is higher, investment in human capital more productive, return on human capital higher, and / or public investment in human capital less progressive. Therefore, education plays an important role in generating intergenerational persistence. In addition, Solon shows that the link between parental income and a child's human capital, as well as the return on investment in human capital, is essential in the transmission of economic status across generations.

In their study, (Cecchi, Ichino, & Rustichini, 1999) demonstrate that a centralized, egalitarian school system reduces the cost of education for poor families and should, therefore, reduce income inequality and promote the IIM. They conclude that Italy, compared to the United States, has fewer income inequalities, as expected, given the type of school system, but also displays lower IIM between occupations and levels of education. The authors explore some of the reasons for this confusing result and conclude that, in a country where the family context is important for labor market success, centralized and egalitarian tertiary education does not necessarily promote the poor but, in fact, it can deprive them of a fundamental tool to prove their talent and compete with rich children.

(Blanden, Gregg, & Machin, 2005) point out that the IIM in Britain is not only declining, but also is lower than in other developed countries. In a more recent paper, (Blanden, Gregg, & MacMillan, 2013), family income is found to be more closely related to sons' results for a cohort born in 1970 than those of a cohort born in 1958. This result is in sharp contrast to the conclusion based on the social class for which the IIM is stable. To explore the reason for this divergence, the authors derive a formal framework for the IIM, as measured by family income or IIM gains as measured by social class. Based on this framework, they then test several alternative hypotheses to explain the difference between trends. They find evidence of an increase in the intergenerational persistence of the permanent component of income that is unrelated to class and they reject the assumption that the decline in the IIM of incomes is a consequence of the poor measure of family income in the 1958 cohort.

(Schad, 2016) demonstrates that the German society is more mobile and less unequal compared to the US and Great Britain. He also concludes that social origin and the return on investment of human capital mainly influence the level of investment in human capital, thus, determining the strength of the parent-child economic link. By capturing this causality, he empirically tests the influence of potential factors; such as education, on the parent-child economic link in Germany. He concludes that, accounting for 20 percent of the intergenerational immobility of income in Germany, education is the most important channel through which economic advantage and disadvantage are transmitted across generations. Education and occupation together are responsible for 40 percent of the existing immobility.

### **Part I: Model borrowed from the literature applied to Moroccan case**

In this part, we apply a model borrowed from the literature to the Moroccan case. Mobility is measured by the income elasticity of the generation of the son compared to that of the generation of fathers. Then, a set of factors such as education, area of residence ... are examined in the light of their contribution to the mobility process. In order to compare the results to those found for the USA, England and Germany, we tried as much as possible to retain the same factors. However, given the importance of the rural population in the case of Morocco, we also selected the area of residence as an explanatory factor of the mobility process.

### **Measuring mobility**

The IIM is commonly measured in the literature either by the income elasticity of the son generation relative to that of the parent generation (noted  $\beta$ ) or by the coefficient of correlation between the two incomes (denoted  $\rho$ ). On the other hand, in most of the same literature, a log-linear relationship is assumed between the two intergenerational incomes. We then borrow the same way to derive the elasticity  $\beta$  from the following simple regression:

$$\text{Log } Y_i^C = \alpha + \beta \text{Log } Y_i^P + \epsilon \quad (1)$$

The constant  $\alpha$  represents the logarithmic mean of the income of the generation of sons with a logarithm of zero parental income,  $Y^C$  the income of the son,  $Y^P$  the income of the parent,  $i$  represents a dynasty. Finally,  $\epsilon$  is the error term. The following relation can then represent the elasticity  $\beta$ :

$$\beta = \frac{\text{Cov}(\log Y_i^C, \log Y_i^P)}{\sigma_p^2} \quad (2)$$

$\sigma_p$  is the standard error of parental income.

The intergenerational income correlation coefficient  $\rho$  is defined by the following formula:

$$\rho = \frac{Cov(\log Y_i^C, \log Y_i^P)}{\sigma_p \cdot \sigma_C} \quad (3)$$

$\sigma_C$  is the standard deviation of the income of the sons generation.

From the two relations (2) and (3), we deduce another one that make possible to relate the two measuring instruments, which will allow us a certain number of analyses.

$$\rho = \beta \cdot \frac{\sigma_p}{\sigma_C} \quad (4)$$

Indeed, the last relationship shows that, unlike the elasticity that does not relate to income inequalities across the two generations, the correlation coefficient  $\rho$  tends to decrease ( $\rho < \beta$ ) when income inequality increases from generation to another. It tends to increase when inequality falls from generation to generation ( $\rho > \beta$ ). The elasticity and the coefficient coincide when the inequalities remain unchanged throughout the two generations ( $\rho = \beta$ ). The income elasticity  $\beta$  measures the part of the son's income determined by the income of the father. In this sense, it measures the immobility and therefore the mobility will be measured by its complement  $1 - \beta$ . The same is also true for the correlation coefficient  $\rho$ . The following table shows the value of the elasticity of intergenerational income ( $\beta$ ) and the intergenerational income correlation coefficient ( $\rho$ ) for Morocco, the United States, the United Kingdom and Germany. The estimates for Morocco are obtained from the estimation of equation (1).

**Table A: the values of  $\beta$  and  $\rho$  for the four countries**

	Morocco	USA	Great Britain	Germany
Income elasticity $\beta$	0.486* (0.062)	0.385** (0.047)	0.294** (0.017)	0.276*** (0.060)
Correlation coefficient $\rho$	0.522* (0.036)	0.301** (0.037)	0.283** (0.017)	0.189*** (0.036)

Source : Authors' estimates

\* Authors' estimates

\*\* (Blanden et al., 2013)

\*\*\* (Schad, 2016)

N.B :

- Values in parentheses are standard deviations
- All values are highly significant ( $p < 0.01$ )

In the absence of similar studies in comparable countries to Morocco, the results of the above estimates show that Moroccan society is much more immobile than the other three. This result corresponds perfectly to our initial hypothesis: the Moroccan society is still a traditional society where the status of individuals is largely inherited because of these factors: the low return on investment in human capital, strong heritability, dysfunctions in the labor market and the education system displaying great inequalities in terms of quality and access to education.

Contrary to popular belief, among the three industrialized countries compared here, the US appears to be the most static nation with an elasticity of 0.385 and a correlation coefficient of 0.301, followed by Great Britain with 0.294 and 0.283. Germany is the most mobile with values of 0.276 and 0.189.

### Income inequality

The difference between  $\beta$  and  $\rho$  shows the importance of income inequalities between the two generations. Indeed, Table B shows that Germany is the country where inequalities between generations are the least important than the three other countries, followed by Great Britain and then the USA.

**Table B: Inequality in the Four Countries**

	Morocco	USA	Great Britain	Germany
Inequalities between sons ( $\sigma_C$ / Average sons income)	0.854*	0.867**	0.661**	0.585***
Inequalities between fathers ( $\sigma_p$ / Average fathers income)	1.019*	0.676**	0.487**	0.460***

Source: Authors' estimates

\* Authors' estimates

\*\* (Blanden et al., 2013)

\*\*\* (Schad, 2016)

Unlike Morocco, the three industrialized countries witnessed inequalities increase among the generation of sons compared to the generation of fathers. This result explains why, in Table A, the elasticity is higher than the correlation coefficient ( $\beta > \rho$ ) for the three countries; the reverse is true in the case of Morocco. When we realize

that the average age of sons in Morocco is 33 years old in 2007 (date of the NSLSHM), (that is to say, the generation which experienced the painful measures of the Structural Adjustment Plan (SAP)), this decrease in inequalities among the generation of sons may seem unexpected. However, this decrease is limited to intra-generational inequalities, and the SAP measures have affected virtually all social categories. Indeed, economists agree that inequality increases in times of economic prosperity (Kuznets, 1955). In the other three countries, most economists agree that inequality has increased in recent decades, notably because of the collapse of the welfare state and the neoliberal policies that followed (Piketty, 2015).

### Decomposition of elasticity $\beta$

According to the literature, the economic status of an individual is influenced by social origin indirectly, through the correlation between the two intergenerational incomes, and indirectly, through the interaction between the effect of parental income and the level of education attained by the child on the one hand, and the child's performance on the labor market on the other. In the following, we proceed in the following way: the pathway factors are added one by one in the order of their occurrence during the life of an individual. Thus, we will analyze successively the area of residence, then education and finally the sector of activity.

For reasons of simplification of our approach, we first analyze the education pathway factor combined with the effect of social origin as measured by parental income on the education of the son. The level of education as measured by the NSLSHM 2007 is a nominal variable, but for simplicity, we will consider it as a continuous variable. For this, we will estimate the following regression:

$$Ed_i^C = \alpha_{Ed} + \lambda_{Ed} \text{Log}Y_i^P + e_{1i} \quad (5)$$

$\alpha_{Ed}$  is the average level of education achieved by the generation of sons with a logarithm of zero parental income.  $\lambda_{Ed}$  is the effect of social origin on the level of education achieved by the generation of children. Finally,  $e_{1i}$  is the error term. On the other hand, according to the literature, the income of the son is a function of both his social origin and of his level of education attained. This implies the estimation of the following relation:

$$\text{Log}Y_i^C = \omega_1 + \rho_{Ed} Ed_i^C + \gamma_{Inc} \text{Log}Y_i^P + v_{1i} \quad (6)$$

$\rho_{Ed}$  is the return on education in the labor market or the return on investment in human capital;  $\gamma_{Inc}$  measures the effect of social origin on the economic success of an individual;  $\omega_1$  is the logarithmic mean of income of the generation of sons with a level of education and a logarithm of zero parental income. Finally,  $v_{1i}$  is the error term. From the two relations (5) and (6), we deduce the following relation:

$$\text{Log}Y_i^C = \omega_1 + \rho_{Ed} \alpha_{Ed} + (\rho_{Ed} \lambda_{Ed} + \gamma_{Inc}) \text{Log}Y_i^P + \rho_{Ed} e_{1i} + v_{1i} \quad (7)$$

By analogy of the two equations (1) and (7), we conclude to the following relation:

$$\beta = \rho_{Ed} \lambda_{Ed} + \gamma_{Inc} \quad (8)$$

The first term of this equation shows the indirect effect of education on son's income. It is equal to the product of the return of education and the effect of social origin on academic performance. The second term shows its direct effect. In other words, the first term has the part of  $\beta$  explained by the education channel, while the second term is the part of  $\beta$  explained by other factors.

By decomposing the "education" factor into three factors: primary education, secondary education and tertiary education, and proceeding in the same way as previously, we obtain the following relation:

$$\beta = \lambda_{Ed1} \gamma_{Ed1} + \lambda_{Ed2} \gamma_{Ed2} + \lambda_{Ed3} \gamma_{Ed3} + \gamma_{Inc} \quad (8)$$

Similarly, for the factor "sector of activity", we have the following relation:

$$\beta = \lambda_{Ed} \gamma_{Ed} + \lambda_{Occ} \gamma_{Occ} + \gamma_{Inc} \quad (9)$$

In the first sequence, we consider only one factor and parental income in determining the income of son's generation. The estimation of equation (7) for the three factors successively (residence, education, branch of activity) allows us to evaluate the importance of each factor in the mobility process. This is obtained by deducing from the coefficient  $\beta$  obtained by estimating equation (1), the new coefficient  $\gamma_{Inc}$  obtained after the estimation of equation (6) for each factor. The percentages are obtained by reducing this difference to the total of  $\beta$ . The results, shown in the first column of the following table, show that the most important factor in the IIM process in Morocco is the "Occupation", accounting for 19% of the total of  $\beta$ . The level of education explains 13% while the area of residence explains only 5%.

The coefficients in the first column show that residing in the urban environment increases the chances of an individual to have a different income from that of his father in comparison with the group residing in the rural environment. Given that the descriptive statistics show that the incomes of urban dwellers are 35% higher than those of the rural population, and that the decline in the relative income ( $Y^C/Y^P$ ) Coefficient, we can confirm that not only is the city more mobile than the countryside, but also that it is upward mobile.

As for the education factor, the coefficients also show that among the three levels of education, only tertiary education contributes positively to mobility by weakening the father-son economic link expressed by the coefficient of immobility  $\beta$  relative to the group "without Education". Individuals with primary or secondary education are less likely to have a different income from their parental income than those without

education. While the outcome for tertiary education can be explained by the high return on education, and consequently, this is an upward mobility, the results of the two other levels seem strange. However, when we calculate the returns for each level of education, only primary education has a lower return than that of the reference group (i.e. "without education"). Based on this observation, the immobility observed at the level of the group with secondary education can be explained as follows: the descriptive statistics show that the parents of sons with secondary education are distributed around the median income. Holders of secondary education cannot aspire to more than a median income; hence this immobility.

**Table C: Factor contribution to mobility**

	Sequence (1)		Sequence (2)		Sequence (3)	
	Part de $\beta$	% de $\beta$	Part de $\beta$	% de $\beta$	Part de $\beta$	% de $\beta$
Area of residence	0.024	5%	0.021	4%	0.020	4%
Primary education Edu1	-0.076*					
Secondary education Edu2	-0.094*					
Tertiary education Edu3	0.407*					
<b>Total education</b>	<b>0.059</b>	<b>13%</b>	<b>0.053</b>	<b>11%</b>	<b>0.048</b>	<b>10%</b>
Construction	0.179**					
Industry	0.352**					
Public service	0.648**					
Services	0.367**					
<b>Total « Occupation »</b>	<b>0.090</b>	<b>19%</b>			<b>0.055</b>	<b>11%</b>

Source: Authors' estimates

- (1) Each factor taken apart
- (2) The factors of "Area of residence" and "education"
- (3) Factors "Area of residence", "Education" in addition to "Occupation"

Higher graduates generally work in public service or in modern sectors of the economy, which explains the high return on this type of education. On the other hand, even if the level of education attained is positively correlated with parental income, children from disadvantaged backgrounds who reach higher education achieve a significant income differential in relation with their parents. Thus, the return of this level and free access to higher education explain its positive contribution to mobility.

Regarding the "sector of activity" factor explaining 19% of the  $\beta$  coefficient in Morocco, all sectors contribute positively to reducing immobility in relation to the agricultural sector (reference group). This result is corroborated by the data from the occupational mobility table D, which shows a strong reproduction at sector level (Appendices). The government sector is by far the largest contributor to reducing the father-son economic link with 65% more than the agricultural sector, followed by the tertiary sector, industry and construction with 37%, 35% and 18%, respectively. The calculation of sectorial returns shows virtually the same ranking as that of the contribution to immobility seen above, which suggests an upward mobility of these sectors relative to the agricultural sector. However, the regression of relative income ( $Y^C/Y^P$ ) on the "Occupation" factor shows that indeed all sectors contribute positively to agriculture in the ascending IIM except for the service sector, which displays rather a descending mobility. This result will seem normal when we take into consideration that this sector covers a wide range of small jobs in the informal sector.

In the second sequential analysis, we take as independent variables the "Area of residence" and "Education". The results shown in the second column of Table 5 show that the share of  $\beta$  explained by the area of residence decreased from 5% to 4% compared to the first sequence, whereas education saw its contribution slightly decrease from 13% to 11%. The combination of the two factors "Area of residence" and "Education" does not add much to the explanation of immobility since the explained part of  $\beta$  does not exceed 15%. Moreover, the results are not significant and problems of collinearity appear.

In the third sequential analysis that takes into account the three factors combined ("Area of residence, education and Occupation), the explained portion of immobility increases to 25% while 75% is due to other unknown factors. The "Occupation" factor is still the strongest, explaining 11% of immobility, followed by "Education" with 10% and finally the "Area of residence" with 4%. Moreover, the results of "Area of residence" are not very significant once again, and when we rerun the analysis by retaining only the two factors, "Education" and "Occupation", the results become highly significant and account for practically the same proportion of  $\beta$ . The relative contribution of each level of education (for each sector of activity) remains the same as in the first sequential analysis where only one factor was considered. That is, urban dwellers are more mobile than rural dwellers, tertiary graduates more mobile than "uneducated", secondary and primary school graduates are less mobile than "uneducated".

**Section II: Intergenerational economic mobility: the Logit model**

In order to test the validity of the results we have found for Morocco in section I, we will develop in this section II a Logit model that we consider more suitable for studying IIM. Indeed, in the following, we have made a change with respect to the literature. Hence, the dependent variable IIM is a dichotomous variable which takes the value 1 if the income of the son is different from the parental income by more than 25% ( $\frac{|Y^C - Y^{CP}|}{Y^P} > 25\%$ ) and the value 0 in the contrary case ( $\frac{|Y^C - Y^{CP}|}{Y^P} \leq 25\%$ ). The Logit model is well prepared for this type of regression.

**Logit model**

According to our discussion above, the IIM is determined by the level of education attained, whether primary, secondary or higher ( $Ed_1, Ed_2, Ed_3$ ). It is also a function of the occupation ( $Occ_1, Occ_2, Occ_3, Occ_4, Occ_5$ ) and area of residence (U, R). To facilitate interpretation, the social origin will be presented by the logarithm based on its parental income ( $Inc_i^P = \frac{Log Y_i^P}{Log 2}$ ). To avoid the obstacles posed by the regression of a dichotomous variable, we regress its odds ratio:

$$Logit_i = Ln \frac{Pr(Mo = 1)}{1 - Pr(Mo = 1)} = \alpha + UR_i + \beta_1 Ed_{1i} + \beta_2 Ed_{2i} + \beta_3 Ed_{3i} + \gamma_1 Occ_{1i} + \gamma_2 Occ_{2i} + \gamma_3 Occ_{3i} + \gamma_4 Occ_{4i} + \gamma_5 Occ_{5i} + Inc_i^P + \epsilon_i \quad (10)$$

In what follows, we present and analyze the results obtained.

**The results**

The results of the estimation of equation (10) are shown in the following Table D:

**Table D: The results of the logistic regression model**

Pathway factors	Coef.	Std. Err.	z	P> z
Urban	0.15	0.4018	0.19	0.848
Primary education	0.86	0.222	1.51	0.03
Secondary education	0.32	0.224	1.47	0.142
Tertiary education	2.06	0.245	1.55	0.05
Buildings	2.02	0.220	0.825	0.01
Industry	2.40	0.231	0.784	0.01
Services	4.26	0.212	0.812	0.01
Government	1.64	0.215	0.775	0.01

Source: Author's estimates

These results show that urban people are slightly more likely (over 15%) than rural people to have a significantly different income than their parents, although the level of significance is rather low. They also show that, with regard to education, tertiary education plays by far a major role in the mobility process. Indeed, a graduate of the university (respectively secondary and primary) has 2.06 (respectively 0.32 and 0.86) times to change his status relative to that of his parents that can do the "without education". For the "activity sector" factor, workers in services (respectively industry, construction and government) have 4.26 (respectively 2.40, 2.02 and 1.64) to be mobile than the reference group constituted by farmers.

**III. Conclusion**

In this paper, we analyzed the role of three factors, namely, area of residence, education and occupation on income formation and the IIM. The analysis is done using two models: one borrowed from the literature of regressing son's generation income on all factors in addition to parental income, the other is to estimate a Logistic regression of the relative variation (plus or minus 25%) of intergenerational income. The results of the first and second models are strongly confirmed.

Indeed, according to the first model, residing in urban areas contributes to reducing the immobility of 5% than to reside in rural areas. This result is corroborated by the calculation of the odds ratios, since the latter model shows that an urban resident has a greater chance of having an income from his or her parental income than his / her rural counterpart. However, for this factor, the results are not significant for either the first or the second model.

Regarding to education, the first model shows that only tertiary education contributes to reducing immobility compared to "uneducated", while primary and secondary education contribute rather to the fortification of the father-son economic link. The calculation of the odds ratios affirms these results for tertiary and primary education, but not for secondary education. Indeed, an individual with primary education (tertiary

education) has 0.86 (2.06) against an opportunity for another individual from the "uneducated" group. The result for the group with "secondary education" is not significant.

The factor "Occupation is the most important factor, according to the first model, explaining 19% of the observed immobility. Moreover, the group of farmers is the least mobile, followed by the one operating in the building, then the one in the industry and finally the group working in the administrative sector being by far the most mobile. The group working in services is more mobile than farmers are, but it is a downward mobility. These results were strongly supported by the second model with a very high degree of significance ( $p < 0.01$ ). Indeed, the calculation of chance ratios shows that an individual working in the construction sector (respectively industry, administration and service) has 2.02 (2.40, 4.26 and 1.64) respectively against a chance for an individual working in the agricultural sector to Have a 25% or more income relative to their parental income.

Briefly, we have shown in this paper that the sector of activity and education are the two main factors in the IIM process. In addition, tertiary education is the only one to contribute to attenuating the father-son economic link. On the other hand, farmers are the least mobile and individuals working in the government sector are the most mobile. These results were corroborated by the standard model taken from the literature as well as by the Logit model that we have developed for this purpose.

Comparing our results with those of industrialized countries, Moroccan society is more immobile than the USA, Great Britain and Germany. Inequalities between generations have increased in all three countries, while they have declined in Morocco. The education factor plays a lesser role in the IIM process compared to the other three countries due in part to its low return.

### **Appendices**

#### **Appendix 1. Nomenclature of the level of education attained**

00-	No level
01-	Kindergarten or
institution of religious education	
02-	M'sid or Koranic
School	
03-	Primary without
vocational training	
04-	Primary with
vocational training	
05-	Middle school
without professional training	
06-	Middle school with
professional training	
07-	Secondary without
vocational training	
08-	Secondary with
vocational training	
09-	Higher without
professional training	
10-	Higher with
professional training	
11-	Other level

*Source : NSLSHM 2007's guide*

#### **Appendix 2. Nomenclature of activity sectors**

01-	Tertiary activities
02-	Government
03-	Agriculture
04-	Others
05-	Buildings
06-	Commerce
07-	Inactifs
08-	Inactives
09-	Transport

*Source : NSLSHM 2007's guide*

**Appendix 3. School mobility table**

Father's level of education	Son's level of education				Total
	Without level	Primary	Secondary	University	
Without level	242	267	242	60	811
Primary	0	66	72	24	162
Secondary	3	12	69	32	116
University	0	1	3	16	20
Total	245	346	386	132	1109

Source:calculated by the author from the NSLSHM

**Appendix 4. Socio-professional mobility table**

Socioprofessional category of the father	Socioprofessional category of the son					Total
	Government	Agri-culture	Construction	Indus-try	Services	
Government	5	4	6	6	10	31
Agriculture	14	217	37	17	31	316
Construction	2	5	23	8	5	43
Industry	2	2	8	13	9	34
Services	7	12	8	20	39	86
Total	30	240	82	64	94	510

Source: calculated by the author from the NSLSHM

**Appendix 5. Statistical Summary of Sample Characteristics**

	Morocco*	USA**	Great Britain**	Germany***
- The average age of fathers	52.2	-----	-----	43.4
- The average age of sons	33.8	-----	-----	30.8
- The average annual income of fathers	27 855.61	-----	-----	34,939 (16,060)
- Standard deviation	(28394.14)			
- The average annual income of fathers	20 664.29	-----	-----	28,956 (16,931)
- Standard deviation	(17651.9)			
- Index of inequalities among fathers	1.019	0.676	0.487	0.460
- Index of inequalities among sons	0.854	0.867	0.661	0.585
- Fathers with primary level or less	57.43%	-----	-----	-----
- Sons with primary level or less	39.59%	-----	-----	-----
- Fathers with middle school level or less	74.39%	-----	-----	-----
- Sons with middle school level or less	66.10%	-----	-----	-----
- Fathers with secondary level	14.74%	-----	-----	-----
- Sons with secondary level	17.32%	-----	-----	-----
- Fathers with university level	10.58%	-----	-----	-----
- Sons with university level	16.33%	-----	-----	-----
- The average annual income of rural fathers	16039.73	-----	-----	-----
- The average annual income of rural sons	15126.42	-----	-----	-----
- The average annual income of urban fathers	32923.89	-----	-----	-----
- The average annual income of urban sons	22302.66	-----	-----	-----

Source :

\*NSLSHM 2007's guide

\*(Blanden et al., 2013)

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