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Transmission and inequality of wealth: An empirical study of wealth mobility from 1800 to 1938 in France

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Abstract. This paper endeavors to measure the intergenerational transmission of wealth inequalities over the 1800–1938 period. For this purpose, we have consulted historical data composed of wealth genealogies covering the 19th and first half of the 20th centuries. The database was created from families included in the "3,000 families" survey of those individuals residing in the *Loire-Inférieure département*. The empirical study reveals a relatively large degree of intergenerational immobility: those whose father had twice the average level of wealth themselves upon death leave behind 1.45 times the average wealth of their generation.

Key words: Galton, inequality, inheritance, wealth transmission.

The intergenerational transmission of wealth inequalities is plural [31]: different forms of capital – cultural, social, symbolic, economic – are transmitted using various means and intensities. This set of themes of intergenerational mobility forms a central focus in the social sciences. A mere sample of the work indicating the importance of such a question would include that of Bourdieu and Passeron [12] and Boudon [11] on academic capital, that of Thelot [35] on social status and Atkinson [5] and Becker [7] on earnings.

In addition to the study of factors that determine the size distribution of wealth, social science researchers should be interested in the degree of mobility of wealth that is exhibited in a society. Many economic models [5, 27] study the different ways in which parents and parental characteristics can influence the economic well-being of their children: education, social capital, 'tastes,' property and financial assets, fertility and marriage, taxation, share rules, etc. They also take into account the role of economic and social changes.

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But wealth accumulation also depends on individual behavior, as models of saving show [10, 20]. Beyond the desire to bequeath,[1] accumulation of wealth satisfies other desires: savings to finance one's old age (life cycle saving), protection against unforeseen events (precautionary saving), desire for power and the search for economic power and social prestige.

The main economic questions behind this field of research concern the evolution of the distribution of wealth. In a growth model, Stiglitz [34] isolates the different economic forces which tend to "make the distribution of wealth in the long run equalitarian and those which tend to make wealth unevenly distributed." For example, in the case of equal sharing between children and other hypotheses about fertility and saving behavior, we tend to make the distribution of wealth equalitarian in the long run.

Based on behavioral models, simulation techniques also allow analysis of the importance of each of these different factors on the distribution of wealth and its transmission. For example, Gokhale et al. [20] show that intergenerational wealth immobility is "primarily determined by the inheritance of skills from one's parent and the magnification of the impact of this inheritance by marital sorting." Blinder [10] shows that the inequality due to inheritance can be explained more by assortive mating than by equal sharing.

We are not attempting in this study, however, to separate the proper role of these different factors in the correlation of parents and childrens' wealth. We only intend to measure the wealth mobility between generations during the 19th century.

In France, intergenerational immobility of wealth has been the object of little study.[2] Most research on the inequality of wealth has concentrated on intergenerational distribution within a population at a given moment in time. Even fewer studies treat the intergenerational aspects of these inequalities because the data is rare. In fact, to observe the transfer of wealth inequality between generations, it is necessary to have data available regarding both the wealth of parents and children at the same time. And yet the protocols of the main wealth studies available do not link the two necessary generations to the calculation of an index of wealth mobility.[3]

Reference to a database of genealogies which links each individual with his own wealth data overcomes such an insufficiency and makes possible a comparison of the wealth left, upon death, by a father and by his children. The "3,000 families" study,[4] which is based on the composition of such a database of genealogies, allows for just such this type of analysis. The data used in this paper stem from that study.

The statistical measure of the intergenerational transmission of inequality was studied for the first time by Galton at the end of the 19th century (1889). Interested in the question of passing on individual height, Galton developed the hypothesis of a "regression towards the mean," a hypothesis which can be applied to other phenomena. In our case, it would suggest that the majority of

descendants of rich families will be less well-off than their parents, but will remain at a level which is higher than the average. Conversely, descendants of poor families shall on average possess greater assets, but still less than the average wealth of their own generation. According to certain statistical hypotheses, particularly if the model can be applied to the following generations, this measurement indicates the speed of convergence towards the average value. In other words, how many generations does it take for the rich to blend in with the middle class? Similarly, for the poor, what is the speed of the rise to middle-class status?

This hypothesis of regression towards the mean wealth falls within a larger issue in the research of determining factors of wealth inequalities. The paper will allow us to find out if, in the specific case of the rural society of the *département* of the *Loire-Inférieure* (today the *Loire-Atlantique*), from 1800 to 1938, there was an identical reproduction of the distribution of wealth or if, on the contrary, all individuals had the same chances to grow richer or poorer.

The database was culled from the families included in the '3,000 families' or TRA study, living in the 19th and 20th centuries in the *Loire-Inférieure département*.[5] Firstly, we put together a corpus of genealogies. Then, for those individuals which we identified, we located the amount of their assets at the time of death. The sources consulted, moreover, allowed us to identify other characteristics of each individual: socio-professional status, date and place of birth, marriage and death, marital status, gender, number of brothers and sisters and children.

The first section is a brief survey of previous measures of intergenerational transmission of wealth inequality. The second section treats the sources and the sample used to measure the transfer of intergenerational wealth inequalities. The third section presents the results of the mobility measurements of wealth in the 1800–1938 period.

1. Some measurements of intergenerational wealth mobility

Measuring the intergenerational mobility of wealth requires estimating the relationship between the amount bequeathed by the father and that left by each child. This implies having wealth data available relative to the two generations at the same moment in their lifecycle. Certain empirical studies, few in number, had, like us, access to inheritance data: the chosen moment in the life cycle being at the time of death [22, 23, 28]. Other studies have treated the questions of the correlation of fortunes between generations using samples of parents and children who are still alive [16, 30, 36]. The two generations are thus taken at different moments in their lifecycle, but it is possible using econometric methods to check this by using age differences.[6]

Harbury et Hitchens [22] used inheritance data to collect the estates of fathers deceased in 1902 who belonged to very wealthy British families. They then

compared those estates to those of their children. The elasticities obtained were on the order of 0.50. In other words, parents leaving two times the average estate for their generation have descendants who leave their own children 50% more than the average estate for their respective generation.

Menchik [28] studied the relationship between the wealth of rich parents (over $40,000) and that of their children using inheritance data from a sample of deceased from Connecticut who passed away between 1930–1940. The child information came from the same database for those among them who had died in the same state by the end of 1976. This study is based on a sample of 190 parent–child pairs. The correlation between the wealth of the parent and that of the child is 0.60 and the elasticity measurements obtained between the wealth of the parents and that of the children is between 0.69 and 0.76.

Kearl and Pope's study [23] comes even closer to our own. They used a sample of data from the second half of the 19th century (1850–1900) of Mormon estates in Utah for whom they had genealogies. The population studied included the rich and those less fortunate. Like Menchik and ourselves, their sample is limited to fathers and their children who died in the same state. They obtained an elasticity measurement less than that of Menchik, of 0.34.

Studies which are based on cross-section data comparing the wealth of the father to that of the children in general obtain lower measurements of elasticity. This stems in part from the fact that they are calculated before inheritance and that they include the global population. They thus put more emphasis on the other factors influencing wealth transfer (abilities, upbringing, professional strategy, cultural influence, *inter vivos* transfers, etc.). Walh [36] estimates coefficients from 0.35–0.60 for 19th century American data. Mulligan [30] obtained elasticities of between 0.40 and 0.50 for the United States using data from the end of the 1990s. Finally, also for the United States and over the same period, Charles and Hurst [16] obtained a lower measurement of 0.37.

2. Wealth data in the *Loire-Inférieure*

In the 19th century, the *département* of the *Loire-Inférieure* was primarily agricultural. Except for its two main cities, Nantes and Saint-Nazaire, it was little affected by industrialization (shipbuilding, canning and foodstuffs industries, soap factories), while trade whose expansion dates back to the 18th century remained an important activity [14, 33]. Its population of 415,000 in 1801 grew to 457,000 in 1826 and 644,000 by 1886. It is thus essentially in the second half of the 19th century that its demographic growth accelerated, both in its rural and big city areas. In the 20th century, Nantes and Saint-Nazaire would see their populations continue to increase while in the countryside the population would experience a period of decline.

Our sample population is made up of families who were included in a study called "3,000 families," residing in the *Loire-Inférieure département*.[7] The

wealth itinerary of the reconstructed family lines covers four, five or even six generations.[8] These biographies were formulated from the Inheritance Archives of the *Administration de l'Enregistrement* [Registry], a part of the tax administration assigned with taxing transfers, which offer the possibility to establish a kind of wealth record book for each individual.

2.1. COLLECTION AND TREATMENT OF INFORMATION

The *Enregistrement* administration, created in *An VII* (1798–1799), was charged with taxing all wealth movements. Documents less than 100 years old remain under the responsibility of the tax administration of the *département* and are located at the tax office.[9] The geographic scope of the *Enregistrement* offices was that of the *canton* [district]. Compared to other wealth documents – particularly the records from legal offices – the *Enregistrement* archives, particularly the inheritance records, offer some clear advantages. The first is that they are easily accessible and generally well–preserved, but most important is the fact that they are exhaustive documents. In fact, they cover the entire population, while the notarial archives only include those individuals who engaged a *notaire* [lawyer], thus a population that is neither socially nor geographically representative.

2.1.1. *Inheritance records*

Inheritance records include the inheritance declaration for every deceased. Such records are composed of the *Tables de Successions et Absences* [*Inheritance and Absence Tables*] and the *Registres de Mutations par Décès* [*Registry of Transfers by Death*]. The former consist of semi-alphabetical lists which present, office by office, all deceased by chronological order of date of death. They provide the place and date of death, the deceased's profession, his or her marital status and, where applicable, the date of the inheritance declaration. From the date of the inheritance declaration, one can cross-reference to the declaration itself, filed chronologically in the *Registres de Mutations par Décès*, which details the composition, value and beneficiaries of the deceased's estate.

2.1.2. *Problems in the use of tax sources*

All types of assets (real property, financial asset and liabilities) should be included in the definition of wealth. But the tax nature of the *Enregistrement* documents leads to a more restrictive concept of wealth. There is the fact that taxpayers may be tempted to underestimate the value of the assets they declare, or even to fail to declare them. In the course of the 19th century, the tax department established inspection procedures, together with fines in case of fraud, which proved very dissuasive. Moreover, the tax department's preemption right served to limit attempts to underestimate exchanged property. Besides problems linked to declared amounts, certain legal angles merit comment:

(1) Firstly, the problem of real property. Up to 1901, real property was taxed not by the *Bureau de l'Enregistrement* where the deceased last resided, but by the *Bureau* where the real property itself was located. In the case of inheritance, the real property situated in another office than that assigned to the deceased's residence was only mentioned on the declaration if said real property was rented. This declaration, in fact, centralized all the real estate earnings, including lease and rental payments.[10] After 1901, there was a centralization of all information contained in the main tax return.
(2) Certain types of property were exempt from estate taxes (foreign shares until 1850, foreign bonds until 1871, etc.)
(3) There is no deduction of liabilities on an estate.
(4) Finally, it would seem that the tax department itself hesitates as to the treatment applicable to those assets which constitute direct business investments.[11] It varies between allowing exemptions of those assets "which may not yet be considered real" or, on the contrary, taxing the assets which are integral part of the estate. In the end, the only trace of such assets is when the heirs declare their existence.

In addition to these legal considerations, reconstituting an estate poses certain problems related to the valuation of the assets. Two difficulties may arise:

(5) Depending on the type of operation, the value of the assets is either an estimated value or a market value. Tax returns being produced for tax-paying purposes, the difference in value of an asset between that assigned by the *Enregistrement* and its true market value may have been greater. Thus in the case of transfers without consideration (estates and *inter-vivos* gifts), the tax value is generally underestimated. For transfers for consideration (purchase, sale or exchange), the value is that of the market.
(6) In order to compare the various amounts by generation, it is sometimes necessary to deflate the values obtained relative to the variations in both the general price index.

2.1.3. *Evaluation of collected data*

At the start, we had 1,602 individual records taken from the *Tables de Successions et Absences*. Given that a single individual may constitute several entries, especially when he is the owner of property which is spread out geographically and thus figures on list of more than one *Enregistrement* office, these 1,602 records in fact correspond to 1,347 individuals.

Genealogical reconstitution work allowed us to put together 289 trees including at least three people. These 289 trees include 4,521 individuals, men and women, TRA and non-TRA. Among the 1,347 individuals for whom we dispose of asset information, 1,084 were able to be identified and 'placed' on

the genealogical trees. A codification was created to identify for each individual present in a tree his or her generation relative to the founding family member, the gender, the total number of children in the sibship and the rank of birth.

2.2. THE TRA OF LOIRE-INFÉRIEURE VERSUS FRANCE: REPRESENTATIVENESS OF DATA

We shall compare in this section the figures obtained using all TRA inheritance records in the *département* of the *Loire-Inférieure* to the available statistics for France as a whole. Inheritance data were updated using cost of living indexes based on the reference year 2000.[12] The comparison with the national data was carried out, for the 19th century, using the *Annuaire Statistique de la France* of 1966 and for the 20th century, with help from the statistics collected by Thomas Piketty [32].

In the 19th century, for the 1840–1849 period, according to the *Annuaire* the percentage of solvent deceased is 54.6%, with an average estate of 100,000 francs 2000 (15,245 €). For the same period, the percentage of solvent deceased in the *Loire-Inférieure* was 56.8%, with an average estate of about 88,000 francs 2,000 (13,416 €). The representivity rate between the average of our sample and the national average is 0.88.[13]

Moreover, it is noteworthy that the *Annuaire Statistique* of 1966 indicates a totally different picture of Paris from the rest of France: in fact, the number of Parisians deceased with bequests was only 27%, but such a group transferred on average nearly 1,000,000 francs 2000 (152,450 €), or over 10 times the amount of the average estate in the rest of France.

For the 20th century, we used the inheritance statistics of the tax department for the period of 1902–1994 collected by Piketty [32].[14] Over the 1902–1913 period, the average estate for all of France (including Paris) was 282,500 francs 2000 (43,067 €) and from 1925–1938 124,600 francs (18,995 €). These amounts are greatly superior to those observed in our sample (60,200 francs 2000 [9,177 €] and 45,000 francs [6,860 €], respectively).[15]

2.3. FATHER–CHILD PAIRS: CONSTRUCTION AND REPRESENTATIVENESS

Our goal was thus to piece together a population of father–child ‘couples.’ To do so, we started with the data gathering all 1,084 individuals for whom we had an indication of the presence or absence of an estate (contained within the *Tables de Successions et Absences*) and identified within the genealogies. This includes the individuals (let’s call them *ego*) for whom we had to: 1) identify the father and 2) locate his estate data.

Identifying *ego* fathers was carried out using the reconstituted genealogies. For the founders of a line, the information relative to the father is missing.

Moreover, in the event an individual moved, even if we know the identity of the father, the inheritance data concerning him is absent since it is archived outside of the *département*. Out of 1,084 known deceased, we reconstituted 641 father–child 'couples.' Among these pairs, we eliminated those deceased who died before their father (58 cases), died too young (134 cases before the age of 6), or for whom we do not have a date of birth (28 cases). Finally, we were compelled to eliminate the cases of children dying after 1938 for whom we did not have inheritance data. In total, our final population was formed of 314 father–child 'couples.'

Let us to compare the results obtained from the 'father–child' pair data to the data collecting all TRA deceased within the *département*.

Table I lists the transmitted amounts within our population of pairs. Thus, nearly two of three (61.8%) of fathers left an estate while, in the overall population of the *département*, the percentage was lower (48.6%). This difference can be explained by the fact that our pairs are composed of a population systematically having children, thus perhaps with more incentive to leave an estate (Arrondel et Masson, 2004).

This conclusion is confirmed by the amounts transmitted, since on average our fathers transfer nearly 113,000 francs (17,227 €) while the average estate of all deceased combined amounts to 70,750 francs (10,786 €). A further consistent result: in the case of the pairs, more than half of children have a father who transmitted assets (55,1%) while for the heirs overall this proportion is only 43%.

The selected sample of father–child pairs thus concerns a richer population than the population of the *département* overall.

3. Method and measurement of intergenerational transfer of inequalities

The thematic of intergenerational mobility asks the question if one has greater chances of being rich (poor) oneself if one's father was rich (poor). Such a

Table I. Number of heirs 1800–1938

Year of death of child	Number of observations	Percentage of fathers leaving an estate (%)	Percentage of children who inherit (%)
Before 1850	50	76.0	58.0
1850–1875	63	76.2	66.7
1875–1900	57	66.7	61.4
1900–1925	88	50.0	48.9
1925–1939	56	46.4	42.9
Total	314	61.8	55.1

Source: TRA study and records of the *département* of *Loire-Inférieure*.
Note: The sample consists of 314 father–child pairs.

question leads to an analysis of the role of inheritance in the inequality of resources by giving us a measurement of the phenomenon of "regression towards the mean" wealth. Before establishing the coefficient of mobility using econometrics, we shall measure, using the degree of correlation, the proximity between the distribution of wealth of fathers and children. The mobility matrix provides an alternative view of this proximity. Correlation and mobility matrix evaluate the intensity of the link between the wealth of parents and children.

3.1. INTERGENERATIONAL CORRELATION OF WEALTH AND MOBILITY MATRIX

Table II shows that the correlation between the wealth of the child and that of his father is around 0.37 for all of our father–child 'couples' combined.[16] Bourdieu et al. [13], working on a similar sample using data from the Calvados, Côte-d'Or, Creuse, Eure, Indre et Loire, Nord, Sarthe and Paris *départements,* obtained a similar value of 0.36.[17]

Another means of measuring the proximity of wealth between generations consists of creating a mobility matrix (Table III). The population was divided according to three categories of wealth. The first group corresponds to estates whose values are inferior to the median values of distributions of wealth for the two generations.[18] The estates belonging to the group of the 50% richest were split up into two groups which correspond to the 3rd and 4th quartile. The interest in such a classification is that individuals may be located within their respective generations so that their relative positions may be compared.

The 50% of the poorest fathers leave on average 545 francs (83 €), the 50% of the poorest children, 1,021 francs (156 €); the 25% of the richest fathers transfer on average 436,755 francs (66,583 €), the 25% of the richest children, 270,285 francs (41,205 €). The averages being very sensitive to external values, it is better to refer to the median values in order to compare the wealth of fathers and sons belonging to the richest quartile. Contrary to the average wealth, the median

Table II. Correlation between wealth of father and child 1800–1938

	Father–Child		Father–Adult Child		Father–Solvent Child	
Year of death of child	Amount	Log.	Amount	Log.	Amount	Log.
Before 1850	ns	ns	ns	ns		
1850–1875	0.37	0.33	0.38	0.29		
1875–1900	0.57	0.53	0.56	0.47		
1900–1925	0.70	0.48	0.71	0.47		
1925–1939	0.57	0.26	0.57	0.29		
Total	0.37	0.37	0.37	0.36	0.40	0.47

Source: TRA study and records of the *département* of *Loire-Inférieure*.
Note: For 1850–1875 the coefficient of correlation between the wealth of the child and that of the father was 0.37. The sample consists of 314 father–child pairs (column 1), 281 father–adult child pairs (column 2), 147 solvent father–solvent child pairs (column 3).

Table III. Intergenerational father–child mobility matrix 1800–1938 (in French francs 2000 and in euros)

		Father's estate					
		<Median	3rd quartile	4th quartile	Total	Average estate	Median estate
Sons's estate	<Median	100 (64%)	31 (39%)	27 (35%)	158 (50%)	1,021 (156 €)	0
	3rd quartile	43 (27%)	22 (28%)	13 (17%)	78 (25%)	22,043 (3,360 €)	20,932 (3,191 €)
	4th quartile	14 (9%)	26 (33%)	38 (49%)	78 (25%)	270,285 (41,205 €)	106,295 (16,205 €)
	Total	157 (100%)	79 (100%)	78 (100%)	314 (100%)	73,190 (11,158 €)	28,775 (4,386 €)
	Average estate	545 (83 €)	16,615 (2,533 €)	436,755 (66,583 €)	112,895 (17,211 €)		
	Median estate	0	14,720 (2,244 €)	92,336 (44,077 €)	21,754 (3,316 €)		

Source: TRA study and records of the *département* of *Loire-Inférieure*.

Note: Among the fathers whose estate value is found in the 4th quartile, 35% have a child whose estate is valued at less than the median value and 49% have an estate whose value falls within the 4th quartile. The sample consists of 314 father–child pairs.

values are very close from one generation to another: 92,336 francs (14,077 €) in the case of fathers and 106,295 francs (16,205 €) in the case of sons. Thus one does not observe that one becomes richer or poorer from one generation to the next.

Referring to the mobility matrix, we find that 64% of children whose father was poor are themselves poor. Within this group, 9% became rich, while the others are located within the same wealth bracket as their father. On the other hand, 49% of the children of rich fathers remain so themselves, while 35% become poorer. It is harder to stay rich than poor.

3.2. THE GALTON MODEL: METHOD AND ESTIMATION

Galton [19],[19] was the first statistician to address the issue of intergenerational transfers. His initial subject of study concerned the inheritance of height from parents to children. The statistical formalization of the Galton hypothesis is set forth in the following equation:

$$X^i_{t+1} = \alpha + \beta X^i_t + \varepsilon^i_{t+1} \quad \beta \in (0,1)$$

where X in our case represents the wealth passed down within the family i by the generations of sons $(t + 1)$ and fathers (t); α and β are the parameters to be estimated; ε^i_{t+1} is the random residual term.

With a value of β between 0 and 1 (strictly), the majority of children of the least well-off families are better off than their parents, although they remain disadvantaged compared to the average of their generation. Conversely, the descendants of richer families are statistically poorer than their parents, even though they remain at a higher level of wealth than the average for their generation. The coefficient $(1 - \beta)$ is thus an indicator of intergenerational wealth mobility and β is a measure of the "inequality of chances."

In other words, if β is equal to 1, society is immobile and children inherit the same relative positions as their parents held; if β is equal to 0, all children have their chance, whatever the position of their parents.[20] If β is less than 1, there is "regression towards the mean."

Note however that this phenomenon does not indicate that the intra-generational inequality lessens since it depends both on the characteristics of β and those of the residual term ε^i_{t+1}.[21]

For the *Loire-Inférieure*, for example, the inequality measured using the Gini index is approximately the same for each of the two generations. Regression towards the average simply translates the degree of intergenerational wealth mobility, meaning to know whether the 'wealth' society is immobile or mobile.

This statistical model can be applied to numerous phenomena: the height of individuals, which was the first subject of analysis chosen by Galton,[22] the number of years of study, earnings and salaries, and the number of children. Thus, based on empirical studies mainly undertaken in the United States in

the second half of the 20th century, the coefficient can be located at 0.29 for the number of years of study, 0.34 for salaries and 0.68 for family size. (Mulligan, 1997). Family behavior is most often transmitted from generation to generation, while the children's level of education is less influenced by that of the parents.

3.2.1. *Estimation of Galton's model on the wealth of two generations*

Tables IV and V present different estimations of Galton's equation.[23] Because of the logarithmic specification, these estimations are expressed in terms of elasticity.[24] The elasticity – whose value always lies between 0 and 1 – measures the impact of a variation of wealth of the father on the amount of wealth of the son. Thus an elasticity value of β signifies that parents whose wealth was 100% greater than the average of their generation (or two times the average wealth) will have children who shall in turn leave wealth of β*100% greater than the average of their generation.[25] In the case of a rigid society where the parents are two times richer than the average of their generation have children who are two times richer than the average of their own, the elasticity is equal to 1. Conversely, in a society which is completely mobile where the wealth of children cannot be inferred from that of the parents, the value of β is equal to 0.

Given the nature of the explained variable – the wealth left upon the death of the child – which presents numerous values equal to zero, the estimation model used is a Tobit[26] *model* which estimates both the probability of being a solvent deceased and, when an estate is left, the amount transmitted *(cf.* Greene [21]).[27]

For the entire population of our 314 father–child relationships, and with the simplest model which studies the wealth left by the child compared to that left by the father without reference to the period or other characteristics of the deceased, the global elasticity is 0.44 (model 1 in Table IV).[28] Parents who are two times richer than the average have children who leave wealth which is 44% greater than that of their generation.[29]

The same estimations calculated over each of the periods (models 5, 6, 7, Table IV) result in a value which is noticeably higher in the second half of the 19th century, over 0.56, although the coefficient is not significant before that time.[30] For the 1900–1940 period, the elasticity is 0.42. The *Loire-Inférieure* society would seem more mobile after 1900.[31]

The previous measurements may be influenced by the length of time between the deaths of the parent and child. If this period is integrated as an explanatory factor of the wealth left by the son (model 3, Table IV), we note that the elasticity measurement is not changed (0.43). The length of time between the deaths of the father and child does not influence the amount left by the son.

Taking into account the socio-professional code of the father's generation and the child's generation as additional explanatory variables strongly modifies the results (model 4, Table IV).[32] The elasticity value decreases by almost half, to about 0.24. How can this decrease be explained?

Table IV. Econometric estimation intergenerational wealth mobility (tobit models)

	Estate of child (in logarithm): 1800–1939			
	Model 1		Model 2	
Variables	Coefficient	*t*-stat	Coefficient	*t*-stat
Estate of father (in logarithm)	**0.593**	6.910	**0.571**	4.112
Age difference at time of death between father and child (10E-1)				
Age difference at time of death between father and child squared (10E-2)				
Indicator of period of death of child* estate of father (in log.)				
Before 1850 (ref.)			0.000	
1850–1875			0.038	0.244
1875–1900			0.101	0.616
1900–1925			0.039	0.244
1925–1939			−0.091	−0.520
Constant	1.091	1.480	1.081	1.470
Control by socio-professional code of father and child				
Number of observations	314		314	
Log- Likehood or R2	−768.73		−768.06	
Estimated elasticity				
Global (Bequests>=0)	0.440		0.422	
Conditional (Bequests>0)	0.311		0.300	
Probability (Presence of a bequest)	0.026		0.025	

Table IV. Continued.

Estate of child (in logarithm): 1800–1939				Estate of child (in logarithm): Separate periods					
Model 3		Model 4		Model 5: before 1850		Model 6: 1890–1900		Model 7: 1900–1939	
Coefficient	*t*-stat	Coefficient	*t*-stat	Coefficient	*t*-stat	Coefficient	*t*-stat	Coefficient	*t*-stat
0.588	6.811	**0.316**	3.482	**n.s.**		**0.697**	5.00	0.6605	4.72
0.710	0.959	0.821	1.183						
−0.090	−0.866	−0.1	−1.04						
0.101	0.100	4.995	3.623	7.668	4.890	0.588	0.46	−0.321	0.280
		yes							
314		314		50		119		144	
−768.26		−737.53		−134.90		−297.40		−327.70	
0.432		0.237		–		0.563		0.424	
0.170		0.308		–		0.413		0.297	
0.026		0.015		–		0.030		0.030	

Source: TRA study and records of the département of *Loire-Inférieure*.

Interpreting the table: In Model 1, the elasticity of the son's estate compared to that of the father is 0.496. This means that if the wealth of the fathers is two times greater than that of their gen leave 44.0% more than the mean of theirs.

Table V. Econometric estimation of intergenerational asset mobility (tobit models or OLS)

	Estate of adult child (in logarithm)			
	Model 8		Model 9	
Variables	Coefficient	*t*-stat	Coefficient	*t*-stat
Estate of father (in logarithm)	**0.604**	6.527	**0.318**	3.240
Age difference at death between father and child (10E-1)			0.818	1.014
Age difference at time of death between father and child squared (10E-2)			−0.010	−0.916
Indicator of period of death of child*estate of father (in log.)				
Before 1850 (ref.)				
1850–1875				
1875–1900				
1900–1925				
1925–1939				
Constant	0.971	1.230	4.914	3.180
Control by socio-professional code of father and child			yes	
Number of observations	281		281	
Log-Likehood or R2	−683.60		−653.60	
Estimated elasticities				
Global (Bequests≥0)	0.445		0.241	
Conditional (Bequests>0)	0.316		0.172	
Probability (presence of a bequest)	0.027		0.015	

Table V. Continued.

Estate of son (in logarithm)				Estate of solvent child (in logarithm)			
Model 10		Model 11		Model 12		Model 13	
Coefficient	*t*-stat	Coefficient	*t*-stat	Coefficient	*t*-stat	Coefficient	*t*-stat
0.571	5.307	**0.270**	2.245	**0.443**	6.350	**0.421**	5.700
		1.234	1.269			0.413	1.720
		0.210	1.496			−0.042	−1.150
1.876	2.027	5.443	3.054	5.680	7.830	5.200	6.170
		yes				yes	
173		173		147		147	
−432.92		−415.78		0.22		0.31	
0.456		0.222					
0.332		0.164		0.443		0.421	
0.024		0.012					

Source: TRA study and records of the département of *Loire-Inférieure*.

Note: The sample consists of 281 father–adult child pairs (Models 8 and 9), 173 father–son pairs (Models 10 and 11), and 147 solvent father–solvent child pairs (Models 12 et 13).

Interpreting the table: In Model 12, the elasticity of the estate of solvent son (amount transfered greater than 0) compared to that of the father is 0.443. This signifies that if the wealth of the fathers is two times greater than that greater than that of their generation, their children shall leave 44,3% more than the mean of theirs.

In fact this result is not surprising if one takes into account the fact that wealth is strongly linked to professional activity. Inequality in assets within a generation of children is also explained by socio-professional categories. Transferring inqualities also takes place through the transfer of professional positions. The process of accumulating wealth cannot be explained exclusively by the amount received in inheritance. The individual also accumulates by himself over the course of his life cycle and this accumulation depends on a certain number of other explanatory factors, including professional status. In the case of the *Loire-Inférieure*, a region with a strongly rural dominant characteristic and where the professional 'agricultural' asset is a strong component in the overall wealth, half of the intergenerational immobility of wealth is explained by professional immobility.

The second series of regressions applies the same calculation to smaller samples (Table V). Applying it only to adult children, the conclusions are the same, the elasticity value being about 0.45 (model 8) and decreasing by half if the social class is taken into account (0.24, model 9). For male children (models 10 et 11), the empirical conclusion is identical (0.46 and 0.22, respectively). Finally, in the sample of the 'rich,' meaning solvent fathers and children, the elasticity is roughly the same for the whole sample (model 12) of 0.44, but does not decrease when the social class is added (0.42, model 13). This last measurement is the greatest. This value could be compared to the value – higher – obtained by Menchik [28] of 0.7, as it only applies to 'rich' deceased and children.

3.2.2. *Inclusion of the grandfather's generation*

Our database allowed us to broaden the estimation model by including the wealth of a third generation, that of the grandfather. The correlation between the wealth of the grandfather and that of the grandson is relatively high, at a level just under the 0.37 observed for the father–child relationship. Intergenerational immobility is thus measured over three generations: the wealth left by the child is assumed to be dependant on both that of his father and grandfather.[33] The position of the child thus depends on both of the two preceding generations. The econometric model is therefore written as follows:

$$X^i_{t+1} = \alpha + \beta X^i_t + \gamma X^i_{t-1} + \varepsilon^i_{t+1} \quad \beta, \gamma \in (0, 1)$$

There is a decomposition in the process of intergenerational transmission between the part which depends on the grandfather and that related to the father. In statistical terms, there is thus a second order rather than first order autoregressive process (Atkinson et al., 1992).

The model was based on 171 grandfather–father–child triplets (Table VI). The elasticity of the wealth of the child compared to that of the father is weaker than within the two generation framework: it is in this case 0.30, *versus* 0.40 for two generations. The elasticity compared to that of the grandfather is 0.27. In

Table VI. Econometric estimation of intergenerational mobility of assets over three generations (Tobit models)

	Child's estate (in logarithm)					
	Model 14		Model 15		Model 16[a)]	
Variables	Coefficient	t-stat	Coefficient	*t*-stat	Coefficient	*t*-stat
Father's estate (in logarithm)	**0.435**	3.326	**0.453**	3.410	**0.440**	3.250
Grandfather's estate (in logarithm)	**0.387**	2.575	**0.432**	2.800	**0.274**	1.600
Age difference at death between father and child (10E_1)			−1.196	0.964	0.205	0.200
Age difference at time of death between father and child squared (10E_2)			0.190	1.221	−0.117	−0.090
Constant	−1.662	1.208	−0.776	0.316	0.962	0.490
Control by socio-professional code of the three generations						
Number of observations	171		171		166	
Log-Likehood	−403.03		−402.05		−390.60	
Estimated elasticity for the father						
Global (Bequests ≥ 0)	0.302		0.315		0.306	
Conditional (Bequests>0)	0.213		0.222		0.215	
Probability (Presence of a bequest)	0.020		0.021		0.021	
Eestimated elasticity for the grandfather						
Global (Bequests>=0)	0.269		0.301		0.191	
Conditional (Bequests>0)	0.189		0.212		0.134	
Probability (Presence of a bequest)	0.018		0.0		0.045	
			20			

Source: TRA study and records of the *département* of *Loire-Inférieure*

Note: a)The estate of the father was instrumented. The instruments used concerned the professional code and the age of the deceased.

Interpreting the table: In Model 1, the elasticity of the estate of the son compared to that of the father is 0.302 and compared to that of the grandfather it is 0.269. This means that if the wealth of the grandfathers is two times greater than that of their generation, their grandchildren shall leave 26.9% more than the mean of theirs.

other words, to have a grandfather two times richer than the average means that his grandson shall leave 27% more than the average for his generation.

One may question this result based on the colinearity between the wealth of the father and grandfather. In a last model, we took into account the correlation (model 16, Table VI). For that, the wealth of the father was instrumented. This requires substituting the amount of the estate of the father for its estimated value according to the instruments in a first step by using a Tobit model for help. The 'instruments' (supplementary variables) used were the father's age and socio-professional code. This lead to an elasticity of 0.31 between the child and his father and 0.19 between the wealth of the child and that of the grandfather.

Over three generations, the only comparable values are those of Walh [36] who obtained both an elasticity of between 0.2 and 0.3 for the wealth of the father and of 0.05 for the grandfather. The influence of the wealth of the grandfather is in their case much weaker than in ours.

4. Conclusion

This study attempted to measure the intergenerational transmission of wealth inequalities using historical data from the 19th and early 20th centuries. Taking as a starting point a database of deceased of 1,347 individuals from the "3,000 Families" study for the *Loire-Inférieure département*, we were able to establish – thanks to reconstituted genealogies – a sample of 314 father–child 'pairs.' For each of the pair members, we cross-referenced their wealth upon death, which we located in the records of the *Enregistrement* (*Tables de Successions et – Absences* [*Inheritance and Absence Tables*] and, where applicable, *Registre de Mutations par Décès*) [*Registry of Transfers by Death*].

The econometric study of the transmission of inequalities leads to the conclusion that intergenerational immobility of wealth between 1800 and 1938 was relatively significant: a fortune which was double the average fortune in the fathers' generation lead on average to a fortune for the child upon his own death of 1.45 times the average for the child's generation. The "regression towards the mean" exists but is found midway between what Galton defined as a mobile society and a society which is totally egalitarian where each generation starts over at zero, without any advantages compared to the preceding generation.

As pointed out in the introduction, various factors can be cited to explain the link of wealth of the different generations: *institutional* factors like the Civil Code which imposes equal division of property and tax treatment which aims to reduce inequalities; *demographic* factors like the marriage and birth rates; *social* factors such as homogamy; and finally *economic* factors linked mainly to growth. The link between generations depends also of individual savings behavior (life-cycle needs, precautionary saving, heritance motives).[34]

The data allowed us to underline the professional factor. We noted that social class very strongly influenced the speed of regression towards the mean which was cut in half. Wealth transfer was most often coupled with professional activity status: nearly two thirds of the deceased were farmers, industry or business owners or person of private means, linked to wealth.

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Notes

[1] The theoretical literature cites various motives in leaving inheritance: the "glow of giving" (paternalism), exchange of wealth for a private life annuity (insurance bequest), altruistic bequests attempting to equalize the standard of living between generations (compensatory bequests), and a desire to live on [4, 15].

[2] Except those of Bourdieu et al. [13] who used a similar sources but related to other *départements*.

[3] The wealth studies conducted by Insee only take into account one generation. The only study which is available for which we have wealth data for two or even three generations is the survey entitled "Three generations" by CNAV in 1992. As the goal was to interview different generations, the wealth was noted as of the same date for the three generations [3].

[4] We recall here briefly the focus of this study (Jacques Dupâquier, in Dupâquier and Kessler ([18], p. 23): "The purpose is to observe through a microscope, from 1803 to today, a sample of 3,000 lineages, representative of the French population, through all public (birth, marriage, death) and wealth (estates) records."

[5] The choice of the *Loire-Inférieure département* (today the *Loire-Atlantique*) is arbitrary but motivated by two reasons:

- essentially rural in the 19th century, the *département* experienced industrial development in naval shipyards in the Nantes-Saint Nazaire port from which one may deduce that the rural exodus was primarily limited to within the *département* itself;
- the quality of the sources: the public records and those of the [Tax] Registry suffered little destruction and the series are relatively complete.

[6] These biases are also present, although less so, for those deceased who pass away at different ages.

[7] The reconstructed lines include not only the 'founder' couples and their descendants of the 3,000 Families sample, but also all the other TRA families of the *département* [1]. Jacques Dupâquier previously distinguished the database of TRA from the sample of TRA [18]. The database included all of the TRA couples noted in the decennial tables at the national level between 1803 and 1832 and it was within this database of 7,500 marriages from which the 3,000 of the sample were culled. For purposes of our research, we worked using all the TRA couples in the *Loire-Inférieure*, without distinction.

[8] Our initial basis was data collected in the scope of the 3,000 Families study: one part demographic data collected by the *Laboratoire de Démographie Historique de l'EHESS* and one part wealth data collected by the *Centre d'Etude et de Recherche sur L'Epargne, le Patrimoine et les Inégalités* (*CEREPI-CNRS*), then by the *Laboratoire d'Economie Appliquée* (*LEA-INRA*). Such data nonetheless required completion.

[9] We were granted permission to consult these *Enregistrement* archives up to 1938.

[10] Using the criteria established by the tax office of the *Enregistrement* itself, this allowed for an estimate of the value of such property.

[11] For an exhaustive description of the problems related to the use of the *Enregistrement* inheritance records, see Adeline Daumard ([17], pp. 3–114).

[12] We resumed and completed the series provided by Levy-Leboyer and Bourguignon [25].

[13] Our figures compare to those of Bourdieu et al. [13], which are based on the use of a TRA sample covering several French *départements* (Calvados, Côte-d'Or, Creuse, Eure, Indre et Loire, Nord, Sarthe and Paris). For the same 1840–1849 period, they obtained a representivity rate of 0.86 compared to national data, the amount listed in the *Annuaire* being greater.

[14] *Cf.* table J-1 in the Piketty study ([32], p. 765).

[15] The most current comparable database to our sample is the "Patrimoine au décès" study carried out by INSEE in 1988 (*cf.* Laferrère and Monteil [24]). According to this source, the West is one of the poorest regions, the deceased leaving on average 360,000 francs (51,833 €), compared to a national average of 493,000 francs (75,157 €). In the *Ile de France* region, the average estate is over two times greater, amounting to some 796,000 francs (121,349 €). As to inheritance, the same would seem true: in the West, heirs inherit on average 103,000 francs (15,702 €) while in the *Ile de France*, heirs receive three times more (292,000 francs [44 715 €]).

[16] Calculating this correlation using amounts expressed in logarithms offers the advantage of being invariant to the deflator used. For the entire period, the measurement is the same (0.37), but the correlations weaker when viewed period by period.

[17] According to our measurements, the link between the distributions of fathers' and children's estates appears stronger between 1875 and 1925. The correlation corresponding to 1925–1938 (0.57) can be compared to that of Menchik [28] who obtained for Connecticut a similar figure in the region of 0.57. He used a sample of wealthy deceased in the 1940s. We note that for our sample of wealthy (solvent deceased), the correlation is stronger, being 0.40 (sum in value) to 0.47 (sum in logarithm). Limiting ourselves to only the solvable deceased (our "rich"), the correlation is very close to that of Menchik.

[18] The median is the estate value which separates the group of the 50% richest from the 50% poorest.

[19] Galton was the first to employ the term regression.

[20] For an exhaustive presentation of this equation, see Masson and Pestieau [26] and Atkinson et al. (1992).

[21] In fact, the variance (indicator of dispersion or inequality) of the child's wealth is written as: $\sigma^2_{t+1} = \beta^2\sigma^2_t + \sigma^2_\varepsilon$. According to this model, there are thus two sources of inequality from one generation to another: that for which the coefficient β plays a central role and that which is random (related to the residual term of the regression). If $\sigma^2_\varepsilon = 0$, the wealth society is deterministic and if β is less than 1, the inequality lessens until it becomes nonexistent. Conversely, if β is equal to zero, the distribution of the children's wealth does not depend on that of the parents and the inequality is solely explained by the characteristics of the random number.

[22] Galton [19] obtained a value of two-thirds for the relationship between the height of the child and that of his parents.

[23] For our empirical analysis, we worked with different samples. In certain regressions, we isolated father–son 'couples' for whom only the son's number of children could be taken into account (173 'couples,' models 10 and 11 in Table V). The reconstituted genealogies are descending genealogies in the male line. In other cases, only the *egos* who died at an adult age were used (281 'couples,' models 8 and 9 in Table V). Finally, we were also interested in the 'rich' population, meaning solvent father–child 'couples' (147 'couples,' models 12 and 13 in Table V).

[24] The econometric specification is based on values in logarithm rather than on levels essentially for two reasons: the first resolves the problem of choice of the index of actualisation; the second facilitates the economic interpretation since the elasticity values of the estate of the child compared to that of the father are obtained directly. These reasons are in addition to those reasons which are purely statistical, for example the correction of the bias of heteroskedasticity [21].

[25] Similarly, parents whose wealth is 50% greater than the average of their generation (or one and a half times the average wealth) will have children who leave wealth which is a^* 50% higher than the average of their generation.

[26] Except for the population of solvent deceased, where given that the amounts transferred are greater than 0, the use of the Ordinary Least Square method to estimate the model is possible.

[27] Three measurements of elasticity are thus proposed: global elasticity, in which we are most interested, the elasticity which is dependant on solvency and that related to the probability of leaving an estate.

[28] If the estates of the parents are measured incorrectly, the estimator of model (1) could be biased. Using an alternative method of estimation (instrumental variable with the districts as instruments), we can show that this bias is negative. So, the estimation of the elasticity in model (1) would be underestimated (around 30%).

[29] The elasticity obtained by Bourdieu et al. [13] on similar data (265 observations from other French *départements*) is a little lower, around 0.30.

[30] The period from 1800–1850 includes, however, only a small number of observations (50), thus rendering the estimations somewhat delicate.

[31] Bourdieu et al. [13] found the same phenomena of a decreasing elasticity after 1900.

[32] This corresponds to a model in which the wealth of the child is explained by that of the father and the professional status of the two generations.

[33] Becker and Tomes [8] who analyzed theoretically the influence of revenues and not of assets of the father and grandfather on that of the son predicted a negative but weak coefficient of the resources of the grandfather combined with a positive but weak effect on that of the parents (*cf.* also [26]). Berhman and Taubman [9], who tested this model, obtained results which tend to contradict this theory: the effect of the resources of the parents is a weak and positive value of 0.2, but the effect of the resources of the grandfathers is either not meaningful, or positive (according to the method of estimation used).

[34] For a study of inheritance motivation with the same data source, see Arrondel and Grange [2].

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