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### A theoretical literature survey on inheritance taxation

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## A theoretical literature survey on inheritance taxation

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# RESUMEN

Este artículo analiza las líneas de investigación y los principales resultados a lo largo de la literatura teórica sobre impuestos a las herencias. Con ese propósito, comparo los hallazgos realizados a través de una recopilación de 25 artículos macroeconómicos publicados desde 1919 hasta 2020. Encuentro que la literatura ha comprendido dos etapas, contribución temprana desde 1919 a 1930, y evolución reciente desde 1974 a 2020. Ambas etapas han contribuido con cuatro principales hallazgos que se han mantenido presentes durante todo el periodo estudiado. Estos son los desincentivos del impuesto sobre la formación de capital, el comportamiento altruista de los padres, el rol de las herencias como un instrumento para compensar la desigualdad intra-generacional, y la ventaja de la familia sobre el gobierno respecto a la información de los agentes. Además, a diferencia de la contribución temprana y la contribución muy reciente, una tasa negativa de impuesto (i.e. subsidio) ha sido el resultado ubicuo. Finalmente, identifico algunas lineas para futuras investigaciones.

*Palabras clave: Impuestos, herencia, patrimonio, motivos para heredar, efectos sobre los incentivos, movilidad inter-generacional, desigualdad intra-generacional, padres altruistas, tasa de subsidio, familia.*

# ABSTRACT

This paper analyses the research lines and main results along the theoretical literature on inheritance taxation. For this purpose, I compare the findings through a compilation of 25 macroeconomic papers published from 1919 to 2020. I find that literature comprehends two stages, early contribution from 1919 to 1930, and recent evolution from 1974 to 2020. Both stages contributing four main findings which have remained present throughout the entire time frame. These are the disincentive effects on capital formation of the tax, the altruistic behavior of parents, the role of bequests as a tool to offset intra-generational inequality, and the family's advantage on information respect to government. Moreover, unlike early and very recent contribution, a negative tax rate (i.e. subsidy) has been the ubiquitous result. Finally, I identify some avenues for future research.

*Keywords: Taxation, inheritance, estate, bequest motives, incentive effects, inter-generational mobility, intra-generational inequality, altruistic parents, subsidy rate, family.*

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# 1 Introduction

Taxation of inheritance has recently become a relevant issue for many sectors in societies. Hence, policymakers all over the world have been pushed to take into account this call in order to address problems mainly related to inequality. This call for taxation, however, not only concerns civil society but also some scholar circles. In that sense, which have been the research lines and results throughout the economic literature on inheritance taxation?

To answer this question I build a literature review by the use of 25 economic papers chosen through the "backward snowballing" methodology.[1] The selection criteria looks at the number of citations and the development of seminal approaches. The totality of articles were obtained at Google Scholar under the topics of *"Inheritance and wealth taxation"*, *"Bequest Motives"* and *"Inter-generational wealth transfers"*. The time frame extends to one hundred and one years from 1919 to 2020. Theoretical development and principal discussions among the authors are thus analysed and compared in detail to identify the relevant lines and results depicted in the literature, as well as the remaining gaps which may be of concern for future research.

My contribution to the existent literature on wealth transfer taxation comprehends both the emphasis on inheritance taxation, and the discussion of very recent research from 2013 to 2020. Previous works also studying these topics are, for instance, Masson & Pestieau (1997) which presents a survey on bequest motives research, Cremer & Pestieau (2006) which addresses the theoretical literature on wealth transfer taxation, and Kopczuk (2013) which develops a survey on taxation of inter-generational transfers and wealth. Nevertheless, unlike this paper, these previous authors address very briefly the specific inheritance taxation issue, and limit their analysis until 2013 therefore not addressing the very recent literature.

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[1]That is, the identification of relevant publications in the literature through the analysis of citations in papers from recent to ancient Wee & Banister (2016).

The paper is organized as follows. Section 2 presents a theoretical literature survey on inheritance taxation through the analysis of early contribution and recent evolution on the field. Section 3 depicts a brief discussion of the remaining gaps in the literature, as well as the suggestion of several avenues for future research. Section 4 concludes.

# 2 A Theoretical Literature Survey on Inheritance Taxation

Through the use of 25 papers published from 1919 to 2020, this section provides a survey of the literature on inheritance taxation. First, the paper analyses the early discussions on the field from 1919 to 1930. Subsequently, the paper presents the two lines addressed in the recent literature from 1974 to 2020, that is, the motivations behind inter-generational transfers within the families, and the optimal inheritance taxation research.

## 2.1 Early designs and discussions

During the last two centuries, inheritance taxation has been a widely studied issue in the literature on social justice and the distribution of power. Philosophical and political economists like Karl Marx, John Stuart Mill and David Ricardo have therefore addressed it in depth. From a modern economics point of view, however, inheritance taxation has been recently addressed since the publication of the paper which I have considered seminal in the field, written by the Italian economist Eugenio Rignano in 1919. After the famous Rignano's *"A plea for economic democratisation"* (Rignano, 1919), some other authors developed more research regarding this tax. Several papers and books were thus published until 1930. All of them discussing the so-called Rignano scheme in detail and proposing their own taxation schemes.

Eugenio Rignano was born in Italy on 1870. As a liberal socialist, he believed in the

emancipation of the working classes through the hand of the State. Therefore, his proposal sought to *gradually* expropriate the private property in order to redistribute it among the people, without affecting the private incentives to create wealth. Though radical, his proposal sought to take distance from the recent-emerged Marxism-Leninism forces in Russia. As one of the ways to avoid that violent scenario and, at the same time, conciliate the need for emancipation of people, he proposed a "progressiveness in time" scheme. It is summarized as follows.

The purpose of the scheme was to transfer the entire amount of a bequest to the State, throughout three generations. Let us suppose then that first generation parents create $X_1$ and let $X_2$ to their heirs, while second generation parents, who received $X_2$, let $X_3$ to their children. Moreover, assume that first generation parents do not receive a bequest (i.e. they give the entire saved fruit of their lifetime own effort). The rates $t_1$ and $t_2$ tax the parents' and grandparents' bequests respectively.

| Bequest | Tax Rate |
|---|---|
| $X_1$ | $t_1 = 0.5$ |
| $X_2 = (1 - t_1) * X_1$ | $t_2 = 1$ |
| $X_3 = (1 - t_2)(1 - t_1) * X_1 + (1 - t_1) * A$ | |

Table 1: The Rignano scheme

Table 1 presents the scheme stipulated by Rignano. Where $A$ represents the own-created wealth by the second generation parents and therefore is taxed differently than the first generation bequest $X_1$. This temporal graduation was the main feature of the Rignano scheme. Note that, since $t_2 = 1$, then $(1 - t_2)(1 - t_1) * X_1 = 0$, which shows the entire transfer of the initial bequest $X_1$ to the hands of the State.

Noteworthy, the scheme reflects that Rignano analyses the costs regarding the tax. Hence, instead of a direct expropriation which would had discourage the needed private saving for capital accumulation (Rignano, 1919); he proposes a gradual setting (i.e. the incentive effects behind the tax consequences are taken into account for the first time in the literature).

The latter concerns the Rignano's "Maximum Project" (Scott, 1926) and, although all the commotion created on the literature, it was never applied on practice because of, among other causes, the inherent difficulty of splitting the parents' and grandparents' bequests. Nevertheless, its publication encouraged a broad avenue of research on the field.

In the 1920's, the British economist Hugh Dalton revisited the Rignano Scheme and designed his own proposal. He sketched it in his famous book *"Some aspects of the inequality of incomes in modern communities"*, whose major insights were summarized by Lavington (1921). According Dalton, when someone deceases two taxes should be applied on the taxable estates (i.e. those superior to an amount $M$, for instance).

Then, let us suppose that the estate $X_0$ surpasses the amount $M$. The tax rate applied on the own-created share $(X_1)$ is $t_1$, and the tax rate applied on the inherited share $(X_2 > A)$ is $t_2$. Where $t_1 \in [0, 100]$ and $t_2 \in (0, 100)$. Moreover, the progressiveness of the scheme is denoted by the following expressions:

$$t_1 = f(X_1), \frac{\partial t_1}{\partial X_1} > 0, \tag{1}$$

and

$$t_2 = f(X_2), \frac{\partial t_2}{\partial X_2} > 0. \tag{2}$$

It should be noted that $X_0 = X_1 + X_2$. Note that both tax rates are progressive and the inherited share of the estate is taxed only after a threshold called $A$. Moreover, also note that the tax can even get the totality of the own-created estates share.

As well as Rignano, Dalton points out the importance of the incentive effects of the tax on savings and capital formation. Hence, although diverging with the Rignano's temporal progressiveness, his proposal seeks to cautious graduate all the tax rates. Further, Dalton adds a relevant issue for the research to come; that is, the revenue needs of the government, in order to pay debt and invest in public goods for palliating inequality. Moreover, an important improve-

ment to the Rignano scheme is also sketched; that is, a better way to separate the inherited from the own-created wealth of the deceased through the establishment of a public Trustee.

In 1926, the British economist Josiah Stamp published his *"Inheritance as an economic factor"* (Stamp, 1926), where he addresses, for the first time in the literature, the causality between inheritance and inequality, the economic effects of the bequest motives, and the economic consequences of the tax.

Noteworthy, Stamp also presents empirical and numerical methodologies in order to improve his results. An statistical attempt of causality between the inheritance taxation and the reduction of inequality is thus presented for the first time in a paper. He does not achieve certain results, however, because of the counterfactual absence.[2]

Concerning the economic effects of bequest motives and taxes,[3] Stamp states the importance of people's desire to give a bequest as an incentive to work and save. Hence, the tax potential danger on those incentives is also pointed out. In that sense, although not presenting a specific tax scheme as Rignano and Dalton, Stamp advocates for a progressive one similar to the Rignano scheme in order to minimize the incentive effects mentioned. All these concerns were the seminal approaches of issues widely addressed in modern economic papers.

In sum, Stamp provided for the first time in the literature methodological tools that allowed him to obtain more rigorous results than his predecessors. Nonetheless, because of the lack of modern statistics at the time, he mentions through the entire paper the need of a better quantitative research in order to get more accurate scientific answers, and thus encouraged future economists to address these topics. Undoubtedly, Stamp's paper was a cornerstone on the early inheritance taxation literature.

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[2]He studied Britain, where the inheritance tax had been active for long time and therefore its impact on inequality could not be measured accurately.

[3]This is a widely addressed topic in recent literature.

One of the Stamp's successors on the field was the British economist Josiah Wedgwood, whose contribution to the literature regards two relevant works, a paper called *"The influence of inheritance on the distribution of wealth"* (Wedgwood, 1928), and a book called *"The economics of inheritance"*, whose major insights were summarized by Wootton (1930). Following Stamp's pioneer steps, Wedgwood presents numerical and statistical attempts to obtain robust conclusions.

His research target was to prove the relevance of inheritance in people's wealth formation in order to sketch a possible tax regime to palliate inequality. Hence, using British public inheritance data, Wedgwood presents a descriptive statistical analysis of the wealth features of parents and children from a specific generation. As well as Stamp, he points out that inheritance perpetuates wealth inequality among families. He concludes saying "There is in our society a hereditary inequality of economic status which has survived the dissolution of the cruder forms of feudalism" (Wedgwood, 1928). After depicting this result in the paper, his inheritance tax proposal is detailed in his 1929 book.

The book presents his tax scheme after showing the British unequal distribution of wealth, which is mostly perpetuated by inheritance and thus creates the social desirability for the tax. He also critiques the idea of inheritance as a capital creation engine. Noteworthy, Wedgwood disagrees with the Rignano Scheme in the way the tax should be addressed. According him, Rignano wrongly assumes that savings and inheritances are orthogonal. Instead, the latter determines partly of the former according Wedgwood.

The tax rates applied under his scheme were divided among testate estates and intestate estates. With $t_1$ and $t_2$ respectively applied on them. Where $t_1 \in (0, 100)$ and $t_2 = 100$. In addition, the progressiveness of $t_1$ means that:

$$t_1 = f(X_1), \frac{\partial t_1}{\partial X_1} > 0, \tag{3}$$

where $X_1$ is the testate progressive taxed estate, and $X_2$ is the intestate estate which is entirely transferred to the State once the individual deceases.[4]

As can be seen, the Wedgwood contribution shares many features with his predecessors. Specially those regarding the motives for the tax and the concerns for the lack of statistic knowledge to better address this issue. Hence, he calls for a more accurate approach in future research and warns about the dangers of generalizing his findings because of the statistical limits, as stated by Stamp (1926).

All the four authors described above represent the early dawn on inheritance taxation modern economics literature. Their contribution transcended decades and is nowadays still discussed in many scholar circles. In that sense, despite the lack of strong theoretical and little quantitative analysis in their approaches, their presence in this survey is essential to understand the future development of the research in the field.

## 2.2 Evolution in recent literature

### 2.2.1 Understanding the bequest motives

The literature on inheritance taxation is built on the motivations behind the transfer of wealth from parents to their children. Therefore, it is essential for this survey to dedicate a section for understanding the development of bequest motives research throughout the years.

The first motivation behind a bequest addressed in the literature regards altruism between parents and their heirs. Barro (1974) thus started the analysis on this field by the use of an overlapping generations model. In that sense, although the core of the paper regards the implications

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[4]Note it is very similar to the Dalton scheme.

of fiscal policy, Barro presents an specific kind of altruistic utility function, as well as a novelty element in the agents' budget constraints for the first time in the literature.

There are two generations in his model who live at the same time before the oldest one passes away. The first generation is currently old at period 1, while the second generation is young at period 1 and old at period 2. Generation 2 features could be generalized for any generation beyond it. The constraints for generation 1 (old), 2 (young), and 2 (old), respectively are:

$$A_1^y + A_0^o = C_1^o + (1-r) * A_1^o, \tag{4}$$

$$w = C_2^y + (1-r) * A_2^y, \tag{5}$$

$$A_2^y + A_2^o = C_2^o + (1-r) * A_2^y, \tag{6}$$

where $A_i^j$ and $C_i^j$ represent the assets and consumption of $j$ individuals' age ($j \in (young, old)$) of $i$ generation ($i \in (1,2)$); and $r$ and $w$ respectively represent the assets' rate of return and the salary received by young individuals only.

Noteworthy, Barro models the assets bequeathed and the assets to bequeath as relevant elements on the agents' constraints for the first time. $A_0^o$ and $A_1^o$ are thus assets inherited and assets to inherit respectively for generation 1 individual, for instance. It is actually the most important link within the generations in his model.

Subsequently, Barro presents his seminal altruistic utility function. It is often called the rational altruistic function, *a la Barro*. That is,

$$U_i = U_i(C_i^y, C_i^o, U_{i+1}^*), \tag{7}$$

where $U_{i+1}^*$ represents the maximized heirs' utility conditional on the agents' endowment and prices.[5] All generations will therefore be linked by inheritance through a *chain dependence*

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[5]Note that general equilibrium solutions depend only on periods 1 and 2 variables because of the function's

between generations 1 to infinite (Barro, 1974). This is the seminal approach for this kind of issues.

Following Barro's line, Gary Becker and Nigel Tomes addressed altruism regarding inter-generational transfers by the development of several family-interaction general equilibrium models.

Becker (1974) therefore began the line of social interactions through the models presented. He builds a general equilibrium model where a "head" maximizes the family's utility subject to the family's constraints. The head thus acts something like a benevolent dictator which internalizes all the externalities regarding her decisions over her children's or spouse's welfare, and therefore achieves the optimal result for the entire family.

He finds that, although the "head" is just one family member, all the other members have the rational incentive to maximize the entire family's welfare, even if their individual utility gets initially harmed. He calls this finding as the "rotten kid theorem" and is summarised as follows.

**Rotten kid theorem:** *if a head exists, other members also are motivated to maximize family income and consumption, even if their welfare depends on their own consumption alone* (Becker, 1974).

He then presents an example in order to clarify the mechanisms behind his theorem. Becker thus points out the following:

> For consider a selfish member $j$ who can take an action that would reduce his income by $b$, but increase that of another member $k$ by $c$. Initially, $j$ would be worse off by $b$, since the gain to $k$ is of no direct concern to him. However, if $c = b$, the head would transfer enough additional resources to $j$ from $k$ to leave

features.

him (and *k*) equally well off, since intrafamily reallocations of income do not affect the consumption of any member. Moreover, if $c > b$ if family income were raised by $j's$ action-and if $j's$ welfare were a superior "good" to the head, then he would transfer enough additional resources to $j$ to make $j$ better off (Becker, 1974).[6]

He then extends the result and states that inter-generational links like bequests allow the family head to offset the inequality of endowments and luck in her heirs. Therefore, as endowments and luck are treated as stochastic, he points out that bequests' sensibility on parents' income take place as an instrument to face the regression toward the mean on children's earnings. This could easily be observed through the increasing income elasticity of bequests on parents' income.

Becker thus shows the relevance of bequests as the compensatory tools to offset any member disadvantage within the family, in order to maximize the family's welfare through each member's utility maximization. Therefore, inheritance as a social mobility instrument was figured out. This is one of the so far main findings in the literature. Inheritance would be treated differently for the upcoming researchers

Subsequently, Becker and Tomes present some other models in order to emphasize the altruistic role of inheritance within the families. Therefore, Becker & Tomes (1979) develop two general equilibrium models with altruistic generational links. First, the link regards the parents' concern of "quality" or economic success of their heirs. Second, the link considers the parents' concern about their children's utility or welfare.

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[6]Becker formulates the next family member's utility function in order to show mathematically the children's concerns on their siblings:

$$U_j = U_j[x_j, g_j(U_k)],$$

where $x_j$ represents $j's$ consumption. Note this is a similar approach as Barro (1974).

In the first case, the utility function maximized by the parents is:

$$U_t = U_t(Z_t, n, \Psi_{t+1}), \tag{8}$$

where $Z_t$ is the parents' consumption, $n$ is the number of children, and $\Psi_{t+1}$ are each child relevant characteristics. Moreover, the authors simplify the notation by specifying that $n\Psi_{t+1} = I_{t+1}$ where $I_{t+1}$ is the children's aggregate wealth.

After some arrangement of the first order conditions, the authors obtain two main parameters which are structural throughout the paper. These are the "propensity to invest in children", called $\beta_t$, that relates $I_{t+1}$ with $I_t$, and the "degree of inheritability", called $h$, that measures the parents' endowment share inherited to their heirs. Their models show that both parameters are key when determining the intra-generational mobility in the long run.

In the second case, the utility function is given by the following expression:

$$U_t = V(Z_t, \psi(U_{t+1})), \tag{9}$$

which shares many features with Barro (1974). Moreover, the authors prove that the features regarding mobility within the family remain exactly as the previous case.

Becker & Tomes (1986) revisit the second case of Becker & Tomes (1979). Under their approach, therefore, altruistic parents choose the bequests that maximize their expected utility subject to the expected earnings and life-cycle assets accumulation of their children. The next expressions are thus presented:

$$U_t = u(Z_t) + \delta U_{t+1} = U_t = \sum_{i=0}^{\infty} \delta^i u(Z_{t+1}), \tag{10}$$

where $Z_t$ is the parents' consumption as before, and $\delta$ is a constant that measures the altruism

of parents.[7]

Their first order conditions reflect that marginal cost of bequeathed assets must equal the rate of return on those assets. Hence, bequests represent a compensatory tool to offset the regression toward the mean on the children's earnings (i.e. the richer the parents, the bigger the bequests that must inherit to their heirs).

Noteworthy, Barro as well as Becker and Tomes present some early insights and effects of a possible progressiveness taxation in their models. Barro thus proposes an inheritance taxation scheme where the tax receipts by government in period ($i$) were equally distributed to the ($i+1$) period agents. He also points out, however, the negative relation between the tax rate ($\tau$) and the bequests' size. He states the following, "it is clear that an increase in $\tau$ will tend to lower the amount of inter-generational transfers. In particular, the higher the value of $\tau$, the less likely that a bequest or gift motive will be operative" (Barro, 1974).

Assuming $\tau$ is small enough to allow all the bequests to be operative, Barro presents the following agents' constraint in his model:

$$w + (1-r)(1-\tau)A_1^o + (1-r)\tau\overline{A_1^o} - B = C_2^y + (1-r)C_2^o + (1-r)^2 A_2^o, \qquad (11)$$

where the relevant element is $\overline{A_1^o}$ which represents the average tax receipt by government in period ($i$), that is transferred to period ($i+1$) agents. Although very briefly, Barro shows a seminal constraint in the literature with this expression.

Becker and Tomes also address the taxation issue briefly. Although they do not formulate an elaborated model like Barro, they warn about the effects of a progressive tax on income inequality, even if a subsidy was provided by the government in order to offset the initial harm. They point out the following: "Although increased redistribution within a progressive

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[7]The authors call this expression as the "dynastic utility", a term that remained to be used by the following researchers.

tax-subsidy system initially narrows inequality, the new long-run equilibrium position may well have greater inequality because parents reduce their investments in children" (Becker & Tomes, 1979).

As shown above, the main insight found by the authors regards the discovery of bequests as compensatory tools within the families, in order to offset inequality among children. Reducing these transfers by a tax thus harms the family's ability to palliate inequality, increasing it in the long-run. This is therefore the mechanism behind the authors warning, and it remained to be used by following researchers.

Although the first bequests motivations in the literature is related to an extensive research on altruism[8], there is also a contribution regarding strategic exchange of inheritances between parents and children. Kotlikoff & Spivak (1981) concern the main reference in the literature.[9]

Through the development of a recursive dynamic programming problem, the authors find that family members like parents and children have enough incentives to agree on an implicit annuities contract through a bequest-sharing mechanism, in order to mitigate through risk-sharing the eventual consumption disadvantages of both members along lifetime. Specifically, the implicit contract regards the bequests transfer from parents to children, only if the latter provides care and consumption to the former when she gets older. It is thus an informal insurance market.

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[8]There is also an avenue of research regarding what is usually called "impure altruism". Agents get utility from the act of giving rather than from pure altruism. They bequeath because they get utility from that rather than from their heirs' utility. These motives are also known as "warm-glow", "joy of giving", "paternalistic" and "bequests as consumption". Andreoni (1990) is one of the main references in the literature.

[9]Some micro economic and game-theoretical approaches have also been done in the literature concerning exchange motives. The most important regards the findings done by Bernheim et al. (1986). The authors propose a game between parents and children were the benefactor (parent) has the ability to persuade his children (beneficiaries) to give him a level of attention (a) by the use of "bequests rules" ($\beta$) among her heirs, and disinheritability threats. They conclude that parents have the ability to extract the entire surplus from their children. Therefore, they use bequests as strategic tools for achieving that equilibrium. The utility functions for kids and parents are: $U_k(C_k, a)$, and $U_p[c_p, a, U_k(c_k, a)]$, respectively. The optimal strategic bequest therefore is: $\beta(a^*) = \beta^*$.

They present the following maximization problem:

$$V_{t-1}(W_{t-1}) = \max[u^H(C^H_{t-1}) + \theta u^S(C^S_{t-1}) + \alpha P_{t/t-1}Q_{t/t-1}V_t(W_t)$$

$$+\alpha P_{t/t-1}(1 - Q_{t/t-1})H_t(W_t) + \theta\alpha Q_{t/t-1}(1 - P_{t/t-1})S_t(W_t)], \quad (12)$$

subject to

$$W_t/R + C^H_{t-1} + C^S_{t-1} = W_{t-1}, \quad (13)$$

where, as stated by the authors:

$V_t(W_t)$ is the period $(t)$ maximum-weighted expected utility of the two family members with joint wealth $W_t$. In the expression the letters $H$ and $S$ denote the two family members, $C^H_t$ and $C^S_t$ are the consumption of the two, $u^H$ and $u^S$ are their utility functions, $P_{t/t-1}$ and $Q_{t/t-1}$ are their respective period $(t)$ survival probabilities conditional upon surviving through period $(t-1)$, and $H_t(W_t)$ and $S_t(W_t)$ are the maximum expected utilities for each member if he or she alone survives to period $(t)$. Moreover, $\alpha$ is the time preference parameter and $R$ is the discount factor (i.e. 1 plus the interest rate) (Kotlikoff & Spivak, 1981).

The solution found by the authors allows them to compare the consumption paths and utility levels between single people and families, in the absence of public or formal annuities market. Parents and children are assumed to have the same degrees of risk aversion $(\gamma)$, as well as the same rates of time preference. The authors present some numerical simulations of their models in order to show the risk sharing existent in the implicit contracts between parents and children.

They find that a four-people family can achieve 70% of the utility that would have gotten under a complete annuities market. A three-people family could substitute 63% of full insurance, and two-people families can substitute over 46% (Kotlikoff & Spivak, 1981). They

conclude that, even in the absence of altruism, the selfish family members have strong incentives to maintain the implicit contracts (i.e. it remains the Nash equilibrium of the model).

Strategic exchange motives are thus relevant issues studied in the literature because of the agents' incentives found. One of the most important insights, however, is the relevance of family as a better way to allocate resources rather than government. Since perfect annuities markets do not exist, the high approximation achieved by families shows its advantage regarding agents' information, transaction costs, adverse selection and moral hazard, respect to governments. This insight would be revisited throughout the literature on inheritance taxation.

The lack of a motive to bequeath has also been an addressed issue. Davies (1981) thus concludes the nonexistence of motivations behind the bequests. Since the bequests are stochastically triggered (i.e. after the parents death), those motives are usually called "accidental" in the literature.[10]

His approach regards the explanation of lower consumption rates among the elderly, as a pure effect of uncertainty during lifetime. Therefore, he discards the existence of a bequest motive for the elderly to save. In order to show this result, he develops a general equilibrium model and finds the consumption rates and paths under certainty and uncertainty.[11] Moreover, he presents numerical examples in order to show his results quantitatively.

Bequest motives conform a broad avenue of research. Not only from the point of view of altruism, but also from strategic considerations among agents, and finally from the nonexistence of any motive. Several relevant papers have been considered here because they reflect the main lines followed by the literature, although the topic extends to more other authors and focuses.

The literature advanced from the early discussions during the 1920's. This is reflected

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[10]Therefore, the inherited bequest is just the non-consumed savings of the parents' life-cycle path.

[11]The differences between certainty and uncertainty is introduced throughout two different constraints. Specifically, under uncertainty the restriction of wealth is not binding.

by the use of novelty macroeconomic and microeconomic tools to address this topic. There-fore, theoretically as well as quantitatively, the literature provided strong frameworks for future studies. It is important also to note the lines that all these authors started following together, specially those regarding the maximizing behavior of agents as pointed out by Barro (1974) for the first time.

Once the motivations behind bequests was addressed, taxation of them was the following step which motivated researchers. Although Barro and Becker had addressed this topic, more research remained to be done, and the next generation provided findings and tools to deep on it.

### 2.2.2   Inheritance and optimal taxation

Optimal inheritance taxation has been addressed very recently, with authors studying it in depth only during the 21st century. Some previous authors, however, depicted an early approach. Economists like Joseph Stiglitz thus are included among those exponents. Although not specif-ically addressing optimal taxation, his contribution is of relevance because its pioneer steps in the field. Stiglitz (1978), and Stiglitz (1981) thus encompass his major insights. Although with different approaches, both arrive to the same conclusions.

The core element in Stiglitz (1981) regards the taxation effects on production factors (labor and capital). He begins therefore presenting the arguments why the tax may discourage capital factor provision (i.e. savings). He states two main reasons. First, the differences in the propensity to save between the rich (who are taxed) and the poor (who receive the benefits) is large therefore the saving disincentive in the former is not offset by the saving increase in the latter. Second, he analyzes the tax incentive effects.

Stiglitz (1981) presents the following per capita budget constraint:

$$C_t + \frac{b_{t+1}}{1+r_t} = w_t + b_t, \tag{14}$$

where $C_t$ is the agents' consumption, $b_{t+1}$ are the bequests she gives, $b_t$ are the bequests she receives, $r_t$ is the rate of interest, and $w_t$ is the wage. He then states $s = s(1+r_t)$ as the savings or bequests[12] rate and finds, after some rearranging, the following expressions for the bequests and the steady state bequests, respectively:

$$b_{t+1} = s(w_t + b_t)(1 + r_T), \tag{15}$$

$$b^* = \frac{sw(1+r)}{1 - s(1+r)}, \tag{16}$$

where $b$ is just the agents' capital stock.[13]

Subsequently, Stiglitz introduces implicitly the bequest as $b_{t+1} = \phi(b_t)$. Denoting $\tau$ as the tax rate, he finds that $\frac{\partial \phi(b_t)}{\partial(\tau)} < 0$ which reflects the same result found by Barro (1974). Hence, inheritance taxation reduces long run savings and capital formation, even assuming the same marginal propensity to save among all agents (Stiglitz, 1981). Using these results, Stiglitz shows that income inequality may increase since the capital's share of output will increase (assuming elasticity between capital and labor less than one) because of the disincentive effects.

The same result is presented in Stiglitz (1978). There he develops two general equilibrium models; specifically, a one class model and a two-class model [14] in order to show the inequality increase.

The capital accumulation equations in the one-class model and the two-class model, re-

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[12]Since all the savings are inherited to heirs.

[13]After showing this, Stiglitz treats inheritance taxation as a kind of capital taxation as well as some other researchers did in the following decades.

[14]With workers and capitalists as agents.

spectively are:

$$k = \frac{s\overline{w} - a}{n - sr + \tau(1 - s)}, \tag{17}$$

$$\dot{k}_w = s_w(w + rk_w) - nk_w, \tag{18}$$

where $k$, $c$, and $s$ are respectively the agents' capital, consumption and marginal propensity to save, $n$ is the rate of increase of the size of the family, $r$ is the interest rate, and $w$ is the agents' wage.[15] Assuming $\tau$ as the inheritance tax rate, Stiglitz further finds the following relations: $\frac{\partial k}{\partial \tau} < 0$, and $\frac{\partial (k_w/k)}{\partial \tau} < 0$.

As pointed out before, it is easy to see the negative relation between capital accumulation and the tax in the one-class model. Note, however, that $\frac{k_w}{k}$ is the workers' capital share in the two-class model, thus the tax not only affects workers' capital but also their share on total capital (i.e. increasing wealth inequality since the capital is accumulated in less hands).

The latter concerns the main insight stated by Stiglitz (1978); that is, that capital/labor ratio changes created by public policy are crucial for inequality dynamics in the long run. He called these the capital accumulation effects. Remember that a key assumption for this inequality increase is the elasticity of substitution between capital and labor, which must be less than one.

Moreover, Stiglitz points out that as capital investment in children is reduced, human capital investment increases causing more income inequality since it is highly related to human capital endowments. Finally, Stiglitz states that firms will have to depend more on outside financing because of the tax, then producing additional costs. The tax, therefore, not only has effects in the factors distribution, but also in their allocation according Stiglitz.

Noteworthy, he also addresses the role of inheritance as a compensatory tool to offset the regression toward the mean on the agents' income and consumption. He therefore argues

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[15] $\overline{w}$ and $a$ are the average salary and the consumption intercept respectively.

that inheritance taxation may also increase inequality of income and consumption from this perspective. Remember it is exactly the same argument as in Becker (1974) and Becker & Tomes (1979).

It is worth to mention that, although not addressing optimal taxation, Stiglitz depicts some ideas about an inequality-minimizing tax rate. He depicts this under the fact that inheritance taxation can actually reduce inequality through relaxing some of his previous assumptions. Beyond some level of the rate, however, inequality necessarily increases, thus the rate that achieves that threshold is accurate. These were the seminal approaches on this field.

The literature on inheritance taxation started several years after. Some authors thus began this line calling for a merge between the literature on optimal income and capital taxation, with the literature on wealth transfer motives. Kaplow (2000), for instance, states that "Until the recent past, there was little interaction between the literature on transfer motives and on tax policy. Recently, however, the importance of transfer motives to tax policy has been increasingly recognized" (Kaplow, 2000).

Subsequently, Cremer & Pestieau (2001) present diverse formulas for the optimal inheritance or estate tax through the development of a general equilibrium model. This was the first paper specifically addressing bequest optimal taxation in the literature.

They build the model under Barro (1974) assumption of altruistic behavior of parents. Furthermore, they determine the tax policy under an utilitarian[16] social planner setting. They present both a perfect information optimum, and an asymmetric information one, in order to address two main findings in the previous literature; that is, the within family information differences between governments and parents,[17] and the compensatory role of inheritance within

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[16]Note that, because of optimal taxation, the social planner notion appears in the literature. Its welfare criterion, however, would vary among the authors.

[17]Recall Kotlikoff & Spivak (1981).

children inequalities.[18]

They assume that parents know exactly the ability of their children while the government only knows the size of the transferred bequests (i.e. the tax function depends on that variable). It is a two-class model where parents may be wealthy ($H$) or not ($L$), while the children may have high or low ability which is reflected in their lifetime wages ($w_i$), ($i \in (2,1)$), where $w_2 > w_1$. Each family has two children, both with different abilities.

The parents' maximization problem is:

$$\max_{b_{i1},b_{i1}} u(W_i - b_{i1} - b_{i2} - T(b_{i1},b_{i2})) + \gamma_1 u(w_1 + b_{i1}) + \gamma_2 u(w_2 + b_{i2}), \tag{19}$$

and the utilitarian welfare function is:

$$W = u(W_H - b_{H1} - b_{H2} - T) + u(w_1 + b_{H1}) + u(w_2 + b_{H2}) + u(W_L - b_{L1} - b_{L2} + T)$$
$$+ u(w_1 + b_{L1}) + u(w_2 + b_{L2}). \tag{20}$$

Finally, they obtain the optimal tax function under the perfect-information setting, and the optimal tax rate under the asymmetric-information setting. Both are respectively:

$$T = \frac{W_H - W_L}{2}, \tag{21}$$

and

$$\tau_{ij} = \frac{T'_{ij}}{1 + T'_{ij}}, \tag{22}$$

where $W$ is the agents' welfare, $b$ are the bequests, $T$ is the tax function, $\tau$ is the tax rate, and $\gamma$ is the altruism parameter from parents to their heirs.

The latter concerns the framework of the paper, however, its core relapses on the different

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[18]Recall Becker (1974), and Becker & Tomes (1979).

tax functions that they obtain depending on the different combinations of parents' altruism devoted to their different abilities children ($\gamma_i$). All framed on the asymmetric information setting.[19]

The authors conclude that estate taxation, that is, a linear tax on the general amount of bequests, is worth when parents do not discriminate among their children (i.e. $\gamma_1 = \gamma_2 = 1$), and weight their heirs' utility with the same value than the social planner does. Estate taxation thus would allow inter-generational distribution, while parents are left alone to manage intra-generational distribution because of their information advantage, recall Kotlikoff & Spivak (1981) and Becker & Tomes (1979). When this does not occur, however, the government should intervene and apply a progressive tax (i.e. non-linear bequest-depending) in order to guarantee welfare maximization. This progressive tax might even be negative thus calling for a subsidy in those families. Hence, the tradeoff between inter-generational and intra-generational inequality is pointed out. Finally, as in Kaplow (2000), the relevance of inheritance taxation as complementary for income taxation is emphasized by the authors. Both schemes are therefore useful for redistribution issues and not necessarily substitutes.

Farhi & Werning (2010) show throughout some diverse models two main features of an optimal estate tax. These are the need for a progressive scheme, and the negative sign of the rate; that is, the need for a subsidy rather than a tax. Interestingly, many extensions are presented thus calling for more research for the upcoming years.

The authors first present a two-period economy with heterogeneous productivity. There is a continuum of parents and children in each period. In period $t = 0$ each parent has one children that lives in period $t = 1$. While parents work and consume, the children only consume. As in Barro (1974), altruism motivates bequests in their models. At the beginning of the first period, parents learn their productivity $\theta_0$ and then produce $n_0$ units of labor which requires $n_0/\theta_0$ units of work effort.

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[19]Some relevant assumptions are applied, the most important regards the non-negativity tax constraint.

The parent's utility is therefore given by the following expression:

$$v_0(\theta_0) = u(c_0) + \beta u(c_1) - h(n_0/\theta_0), \tag{23}$$

where sub-indexes 0 and 1 refer respectively to parent and children, $c$ refers to consumption, $h$ is the desutility function of labor, and $\beta$ is the altruism parameter which is assumed less than one.

Social planner maximizes utilitarian social welfare functions of parent and children $V_0$ and $V_1$, subject to three constraints. One reflecting the resources constraint with endowments in both periods and rate of return in savings $R$, and the others reflecting incentive compatibility constraints. Since $V_1$ is inserted in $V_0$, the problem reduces to:

$$\max V_0 = \int_0^\infty \left( u(c_0) - h(n_0/\theta_0) \right) dF(\theta_0) + \beta V_1. \tag{24}$$

Subsequently, the authors derive implicitly and explicitly the optimal taxes in order to show its progressiveness. Inheritance and estate tax thus respectively are:

$$\hat{\tau}(\theta_0) = \frac{\tau(\theta_0)}{1 + \tau(\theta_0)} = -\frac{1}{\beta}\frac{v}{u}u'(c_0(\theta_0)), \tag{25}$$

and

$$\tau(\theta_0) = \frac{\hat{\tau}(\theta_0)}{1 - \hat{\tau}(\theta_0)} = -R\frac{v}{u}u'(c_1(\theta_0)), \tag{26}$$

where $v$ and $u$ are just the multipliers associated with the Lagrangian of the problem.

Note that, since $u(c)$ is increasing and concave, both tax expressions $\tau(\theta_0)$ and $\hat{\tau}(\theta_0)$ are negative and increasing in $c_1$ and $c_0$ respectively. The progressiveness thus regards on consumption which increases on productivity ($\theta_0$), while the subsidy is denoted by the negative sign. Therefore, the richer the parents, the larger the subsidy that should be transferred to their

children in order to reduce inter-generational inequality because of regression toward the mean mechanisms.[20]

The paper also depicts some insights about explicit[21] estate taxation in complement with other kinds of taxes, as stated by Kaplow (2000), and Cremer & Pestieau (2001). Specifically the authors address the complementary income tax. The previous results hold in this case although the new estate and inheritance taxes, $T^b$ and $\hat{T}^b$, do not depend directly on the agents' consumption as before.

The latter concerns the core of the paper, however, the authors present a broad section of extensions regarding many topics on the field and thus calling for some avenues in future research. Table 2 summarises them.

Farhi & Werning (2010) develop all the extensions mentioned as robustness checks for their benchmark results. In all cases they conclude the negativeness and progressiveness of the optimal estate and inheritance taxes. Their new approaches, however, would begin to be addressed by other authors in the upcoming literature.

In 2013, Thomas Piketty and Emmanuel Saez published which I have considered the so far broadest paper in the literature on inheritance taxation. Piketty & Saez (2013) thus present a theory for optimal inheritance taxation whose findings represent the final merge outcome of many scattered lines of previous research described along this paper.

The authors therefore merge the previous findings on optimal capital and income taxation provided by Atkinson & Stiglitz (1976), Chamley (1986), and Judd (1985); with the bequest motives findings provided by Barro (1974) and Becker (1974), as well as Davies (1981). Linear inheritance tax formulas are presented with diverse elements like elasticities and social care

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[20]Recall Becker & Tomes (1979).

[21]That is, adding the tax directly in the constraints.

| Farhi and Werning's focuses | |
|---|---|
| Welfare criterion | Rawlsian welfare criterion, adding new constraints of the type $u(.) \geq u^*$, were $u^*$ is the minimum level of utility of an specific agent. |
| Human capital | Educational investment is also an important transfer done by parents to children. Therefore, incorporating human capital functions $(H)$ in the inheritance taxation models may be accurate. |
| Fertility differences | Adding endogenous or exogenous fertility differences among the households might allow interesting interpretations between inheritance taxes (payed by heirs) and estate taxes (payed by parents). |
| Non-negative rates | An attempt to include real fiscal constraints might regard the inclusion of non-negativity constraints on tax rates of the type $\tau > 0$. Subsidies therefore do not apply anymore but instead zero or positive tax rates.[22] |
| Infinite-horizon | Weighting the future generations welfare through the development of infinite-horizon versions of the models might allow interesting insights for inheritance and estate taxation. |

Table 2: Farhi and Werning's novelty focuses.

weightings. Contrary the previous contribution, Piketty and Saez's progress regards the discovery of positive marginal tax rates in order to achieve optimal results. Moreover, they address for the first time labor supply issues of the tax.

All the tax formulas developed depend on elasticity and distributional parameters for the first time in the literature. There are two kinds of elasticity parameters, that is, long-run elasticity of aggregate bequest flow ($b_t$) respect to the net of bequest tax rate (1 - $\tau_B$):

$$e_B = \frac{1 - \tau_B}{b_t} \frac{\partial b_t}{\partial (1 - \tau_B)}, \tag{27}$$

and long-run elasticity of aggregate labor supply ($y_{Lt}$) respect to the net-of-labor-tax rate (1 -$\tau_L$),

$$e_L = \frac{1 - \tau_L}{y_{Lt}} \frac{\partial y_{Lt}}{\partial (1 - \tau_L)}. \tag{28}$$

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[22]Farhi & Werning (2010) develop a small model and show that zero optimal tax applies only up to a threshold $\theta_0^*$ of productivity. Beyond that point, the optimal tax is positive.

On the other hand, there are three types of distributional parameters. These are:

$$\overline{b}^{received} = \frac{\int_i g_{ti} b_{ti}}{b_t}, \tag{29}$$

$$\overline{b}^{left} = \frac{\int_i g_{ti} b_{t+1i}}{b_{t+1}}, \tag{30}$$

and

$$\overline{y}_L = \frac{\int_i g_{ti} y_{Lti}}{y_{Lt}}, \tag{31}$$

where $g_{ti}$ is the marginal social welfare weighting $(SWF)$[23] that society puts on individuals' consumption increase. Specifically, it measures the relative social welfare increase when individual $(ti)$ consumption increases in \$1. For rich people it is small while for poor people it is high. $\overline{b}^{received}$, $\overline{b}^{left}$, and $\overline{y}_L$ are thus the ratios of the population averaged weighted by social marginal welfare weights $g_{ti}$ to the unweighted population average (Piketty & Saez, 2013).

The dynamic stochastic general equilibrium model presented as framework in the paper thus finds the optimal tax formula for the steady state long run optimum.[24] Therefore, through individuals' utility maximization and the government's long-run social welfare maximization, the tax rate derived is the following:

$$\tau_B = \frac{1 - \left[1 - \frac{e_L \tau_L}{1 - \tau_L}\right] \left[\frac{\overline{b}^{received}}{\overline{y}_L}(1 + \hat{e}_B) + \frac{1}{R}\frac{\overline{b}^{left}}{\overline{y}_L}\right]}{1 + e_B - \left[1 - \frac{e_L \tau_L}{1 - \tau_L}\right] \frac{\overline{b}^{received}}{\overline{y}_L}(1 + \hat{e}_B)}, \tag{32}$$

where $R$ is the rate of return on bequests and $\hat{e}_B$ is the average of $e_{Btu}$ weighted by $g_{ti} b_{ti}$.

Subsequently, the paper derives six more tax formulas after adding some elements like public debt and diverse welfare criterion. For the purposes of this paper, however, we only address the case of a different welfare criterion since, as noted by Farhi & Werning (2010), it is a recent innovation in the literature.[25]

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[23]This weighting is key for the authors' results. Moreover, it is an unprecedented innovation in the literature.

[24]Government budget is assumed to be balanced in each period.

[25]The paper depicts formulas in the case of social welfare discounting, social welfare discounting in a closed

Specifically, the paper analyses the case of a "Meritocratic Rawlsian" steady state optimum, where the social welfare weights $g_{ti}$ are put depending on a normatively appealing concept that, "Individuals should be compensated for inequality they are not responsible for—such as bequests received—but not for inequality they are responsible for—such as labor income" (Fleurbaey et al., 2008).

All bequests receivers are therefore zero social welfare weighted, while zero-bequest receivers are positively weighted. The following is the optimal tax rate that maximizes long-run welfare of zero-bequests receivers:

$$\tau_B = \frac{1 - \left[1 - \frac{e_L \tau_L}{1 - \tau_L}\right] \frac{1}{R} \frac{\bar{b}^{left}}{\bar{y}_L}}{1 + e_B}. \tag{33}$$

In sum, several insights are depicted by Piketty & Saez (2013). First, the equity-efficiency tradeoff is easily observed since distributional issues, represented by society cares ($SWF$), may pressure for a higher tax while distortion effects on the efficient paths do not. Moreover, the variables' sensitivity emphasized by the elasticities is also an important contribution, as well as the denotation of bidimensional inequality. Therefore, contrary Farhi & Werning (2010), the authors state that inequality emerges not only from income, but also from inheritance, and thus justify the need for both kinds of taxes in the policies mix.[26] Finally, the paper briefly addresses the case of accidental bequest motives. [27]

Finally, Belan & Moussault (2020) is worth noting to mention.[28] Although not specifically addressing optimal inheritance taxation, its relevance relapses on two lines. First, it applies the methodological tool that has recently become more used in economics, that is, quantitative

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economy with public debt, and even presents formulas using previous benchmarks like the models developed by Farhi & Werning (2010), Barro & Becker (1989), and Becker & Barro (1988).

[26]This insight is key for the existence of a positive tax rate which differs with Farhi & Werning (2010) findings. Noteworthy, under the Farhi & Werning version of their model, the tax rate may be negative or even zero depending on ($SWF$).

[27]Precautionary motives for saving are the mentioned by Piketty & Saez (2013), remember it is the main insight found by Davies (1981).

economics. Second, it represents the merge of several previous developed issues on inheritance taxation, and develops some recent innovations in the literature.

Through the use of a two-period overlapping generation model with rational altruism as in Barro (1974), Belan & Moussault (2020) show the welfare effects of a fiscal reform that replaces capital taxation with inheritance taxation. Additionally, it assumes that capital labor ratio remains constant in order to avoid the disincentive effects first noted by Stiglitz (1978). The authors also address the recently-studied issue of labor supply effects of the tax. It depends on the tradeoff between time and wealth transfers from parents to children in their model. Time transfers[29] are therefore an innovation in this paper. Welfare improvements indeed depend on the magnitude of the labor supply effect.

After solving government's and individuals' maximization problems[30], the paper finds the first order conditions of the steady state equilibrium and uses them for the following models. Subsequently, three new settings are presented. First, the setting *a la Barro* with inelastic labor supply and wealth transfers but no time transfers. Second, they relax the Barro's inelastic labor supply assumption but still work with wealth transfers only. Finally, they present the complete model with both inter-generational transfers active, bequests $(x)$ and time $(T^o)$, as well as elastic young labor supply. For the purposes of this paper we will only deep in the latter setting results.

As well as Barro (1974), long-run steady state welfare diminishes with the tax in the first case. In the second case, welfare improvements depend on the parameters. In the third case, however, the welfare effects depend on the ratio $\sigma^o/\sigma^u$, where $\sigma^o$ is the elasticity of substitution between time transfer when old $(T^o)$, and old consumption $(c^o)$, while $\sigma^u$ is the elasticity of substitution between the agents' utility when young $(f^y)$ and old $(f^o)$. Therefore, as soon as the

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[28]For a very similar methodological approach, see Kindermann et al. (2020). They depict labor supply and human capital effects of the tax, as well as Stiglitz (1978), Farhi & Werning (2010), and Belan & Moussault (2020).

[29]That is, home production time like child care and leisure.

[30]Individuals' utility function is: $U_t = uf^y + vf^o + \beta U_{t+1}$ where $f^y$ and $f^o$ represent utility in both periods while $U_{t+1}$ is the next generation welfare weighted by the altruism parameter $\beta$. Note that this function shows the same relations than Barro (1974).

ratio $\sigma^o/\sigma^u$ increases, the welfare also does. Hence, contrary many of the previous findings, welfare increases with the appliance of an inheritance tax scheme.

The main mechanism behind this result regards the tradeoff created by the tax between wealth transfers (bequests) and time transfers (home production), from parents to children. Since the tax disincentives the bequest transfer[31], time transfers increase and thus the young individuals' labor supply also does. This happens since, for instance, grandparents can take care of their sons' children therefore allowing them to destine more time to work. Hence, utility gains from the increase in labor supply and consumption in young are bigger than the reduction in parents' consumption and capital bequests.

Finally, the authors develop some numerical simulations of their results through empirical calibration of their parameters with the french economy data. Therefore, throughout the use of modern quantitative tools the paper presents the long-run transitional dynamics of all the variables after the inheritance tax reform.

# 3  Discussion

As shown throughout the paper, the literature on inheritance taxation has regarded the economic analysis of some political claims like redistribution and social justice in societies. Therefore, since the early discussions in the 1920's to the recent literature in the 1970's and 1980's, the hidden costs behind the tax have been extensively studied. In recent years, although addressing specifically optimal inheritance taxation, those research lines have maintained.

Nevertheless, since Piketty & Saez (2013), some new avenues of research can be depicted in order to address new understandings of inheritance taxation for the upcoming future. I then

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[31]Recall this is a widely obtained result in the literature.

summarise the main issues which I consider should be taken into account for future economists, in order to advance in science through the use of novelty theoretical tools and focuses, as well as the one-hundred year previous literature shown along this paper.

The first evident gap in the optimal taxation research regards the need of different bequest motives or mixed bequest motives in the theoretical modelling. As could be attested, inheritance taxation has exhaustively used the altruistic motive assumption behind the inheritances. Therefore, other motives like strategic exchange or accidental bequests might be worth to analyse in order to obtain more realistic taxation schemes. For instance, Kopczuk (2013) points out some relevant insights about the bequest-motive-dependent results on inheritance taxation, thus the inclusion of more motives should be taken into account in the upcoming research. Moreover, bequest motives diversity in the future models could even conciliate the gap between theoretical and empirical studies in the field.[32]

Second, the literature should take into account the relevance of human capital transfers as mechanisms for maintaining inequality within families and societies. This issue has been very shallowly addressed on inheritance taxation research, and given the recent empirical literature showing its relevance for long-run inequality, it should be more theoretically analysed in the upcoming years.

Third, the social desirability of the tax might be important to analyse. As noted along the paper, inheritance taxation literature has maintained in the family inequality setting. A more appropriate scheme might regard the inclusion of social weightings like the built by Piketty & Saez (2013), as well as other kinds of welfare criterion like rawlsian. Interesting tools from behavioral economics might be useful for this merge like inequality aversion theoretical models.

Fourth, political economy issues and heterogeneity of agents would be accurate to address as well. Political power and economic status represent a relevant factor for long-run wealth in-

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[32]Kopczuk (2013) presents some empirical findings.

equality as recent political economy studies have found. Therefore, its inclusion in inheritance taxation literature might be precise. Moreover, these issues could be analysed through the inclusion of heterogeneous agents in the models. The latter has been shallowly addressed in inheritance taxation literature, and mostly regards productivity or ability heterogeneity which is of little concern when studying political economy issues. For instance, political power heterogeneity of agents might be accurate to design inheritance taxation models.

Finally, tax avoidance might be a precise advance in literature. Although widely empirically studied, theoretical modelling of tax payers evasion could provide a better understanding of inter-generational transfers and its taxation.

# 4   Conclusions

Through the use of 25 papers published from 1919 to 2020, this paper has analysed the research lines and the results obtained along the theoretical literature on inheritance taxation. Two main stages have been found in the literature. First, the early designs and discussions on the field started from Rignano (1919) to Wootton (1930), and second the recent evolution started from Barro (1974) to Belan & Moussault (2020). Both Rignano (1919) and Barro (1974) are therefore the seminal publications in both stages respectively.

Along the entire literature, the motivation for addressing inheritance taxation research has regarded the economic analysis of the recurrently political claims for taxation as a tool to reduce inequality. Therefore, from the first stage the contribution mainly considered the hidden costs of the tax. Specifically, the disincentive effects on savings and capital formation. Importantly, all the early authors remained using the first discussions stated by Rignano (1919). That stage ended with the call for more quantitative and theoretical tools for the upcoming researchers in order to obtain more accurate results.

The same lines remained to be addressed for the second stage authors. However, the theoretical and quantitative development exponentially improved, as well as the addition of new related issues. As well as Rignano (1919) in the first stage, the contribution of Barro (1974) remained to be used by the following authors until the current days. Moreover, the recent literature followed two main lines of research. First, the motives behind the bequests transfer within families, and second the optimal inheritance taxation approach.

Optimal inheritance taxation research merges both the previous contribution on bequest motives, and the optimal capital and income taxation literature. Therefore, Becker (1974), Becker & Tomes (1979), Kotlikoff & Spivak (1981), and Davies (1981) contribution remained to be used until the current literature. Specifically, their findings on altruism behavior of parents, on bequests as an instrument to offset intra-generational inequality among families, and family's advantage on agents' information respect to government. Farhi & Werning (2010), Piketty & Saez (2013), and Belan & Moussault (2020) encompass the final outcome of this merge. Furthermore, the three present novelty issues in the literature thus opening avenues for future research.

Although a positive and progressive inheritance tax rate was the main conclusion in the first stage, a negative tax rate (i.e. subsidy) has been the main result along the recent literature. After Piketty & Saez (2013), however, new elements provided have allowed to obtain positive and zero tax schemes. Diverse methods have been applied in the literature, however, the big avenue of research is framed on macroeconomic modelling theory.

The limitations faced concern the reduction of the broad literature to the seminal and more cited papers only. Therefore, some other authors and focuses perhaps could not be addressed as deserved. In addition, I was not able to provide more detailed graphical instruments in order to explain more accurately the results obtained along the literature. Future versions of the paper may address these further elements.

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