

# Another Chapter in the History of Ramsey's Optimal Feasible Taxation\*

Pedro Garcia Duarte

Department of Economics, University of São Paulo (FEA-USP)<sup>†</sup>

## Resumo

Paul Samuelson praticou seu programa de “Whig history of economics”. Um exemplo disto é sua história sobre como a contribuição de Frank Ramsey (1927) à literatura de tributação ótima: para Samuelson e os economistas de finanças públicas que redescobriram Ramsey nos anos 1970, Ramsey era um gênio a frente de seu tempo que utilizou matemática muito avançada para seus contemporâneos. Somente nos anos 1970 é que os economistas obtiveram o conhecimento matemático que lhes permitiram apreciar a obra do jovem matemático. Em tal redescoberta um memorando escrito por Samuelson para o Tesouro norte-americano em 1951 tornou-se um elo central para a nova geração. Neste artigo eu examino a história contada por Samuelson, o contexto histórico do aparecimento da literatura de tributação ótima nos anos 1970 e o processo de canonização de Ramsey em finanças públicas.

**Palavras-chave:** Tributação ótima; Teoria de “second best”; Regra de Ramsey; Paul Samuelson; Frank Ramsey

## Abstract

Paul Samuelson proposed and practiced a program for the Whig history of economics. One such example is his account of Frank Ramsey's contribution to optimal taxation in 1927. For him and mainly for the public finance economists who rediscovered later Ramsey's contribution, Ramsey was a genius ahead of his time who used a mathematics too advanced for his contemporaries and was rediscovered only in the 1970s, when economists became more mathematically literate. In such rediscovery, a memorandum that Samuelson wrote in 1951 for the US Treasury became central. I examine Samuelson's account and the historical context of the emergence of the optimal taxation literature in the 1970s and the canonization of Ramsey.

**Keywords:** optimal taxation; second-best equilibrium; Ramsey rule; Paul Samuelson; Frank Ramsey

Área ANPEC: 01

Classificação JEL: B-20, B-31

---

\*This article is a reduced version of an article based on parts of my Ph.D. dissertation (a more detailed version is available from the author upon request). I thank CAPES (Brazil) for financial support. I am very grateful to professors Roy Weintraub, Kevin Hoover, Neil de Marchi, Craufurd Goodwin and Craig Burnside for all encouragement and suggestions. I thank also Kirk White, Tiago Mata, Dan Hammond, Paul Dudenhefer, Manuela Mosca, and two anonymous referees for criticisms and suggestions. As usual, I am responsible for the final outcome and any remaining inaccuracies.

<sup>†</sup>Corresponding author. Departamento de Economia (FEA-USP), Universidade de São Paulo, Av. Prof. Luciano Gualberto 908, Cidade Universitária, São Paulo, SP, Brazil 05508-010. E-mail address: pgnuarte@usp.br.

## Another Chapter in the History of Ramsey's Optimal Feasible Taxation

There are at least two remarkable features about Paul Samuelson's connection to the history of economics. The first, as described by his colleague Robert Solow in a letter to Roy Weintraub (1991, 56), is that "Paul is one of the more compulsive citers in history." He is known for combining several economists' names to refer to an idea, a concept or a model like the "Swan-Phelps-Robinson theorem" and the "Robinson-Sraffa-MIT model", or "the Schumpeter-Ramsey Golden Rule state of Bliss", "the Ramsey-Savage-Neumann axioms of expected utility", or even "a one-sector 'leets' model of Ramsey-Solow-Swan-Meade type" — one can find even longer chains of names used by Samuelson. Besides this habit of creating such chains Samuelson liked referring to several past and present economists (like in Samuelson (2003a)) and his compulsion for citing made his readers encounter in his work a mythic past and a list of outstanding precursors to which to engage with.

The second remarkable feature of Samuelson is his well known program for "studying the past from the standpoint of the present state of economic science," or "Whig History of Economic Analysis" (Samuelson (2003b, 182)). More than proposing such program, Samuelson practiced it through many historical articles or comments he wrote over his life. As an active participant of many debates, he was willing to tell his version of how particular ideas or models developed, as it is the case of Frank Ramsey's 1927 contribution to optimal taxation (or the theory of the *feasible* first best, as Samuelson called it), which he discovered in the 1950s and which was later rediscovered by a new generation of public finance economists.

Samuelson ([1982] 1986) recounted that Jørgen Gelting asked him in September 1948 what he thought about Ramsey's conclusion that goods should be taxed so that the production of them all (be they luxuries or necessities) is reduced in the same proportion. He replied that he "had always found Ramsey's underlying model to be too ambiguous, too ill defined." However, Samuelson's interest on Ramsey's analysis arose after Gelting informed him that in a trip to the United States he had heard Harold Hotelling lecture on a similar tax analysis stating that it was in fact John Hicks "who had also independently arrived at Ramsey's rule." Samuelson changed his opinion on Ramsey's contribution to taxation because he admired both Ramsey, Hotelling and Hicks and "three such able men" could not be independently "making a fuss about nothing" (77).

Samuelson then tried to formulate and solve Ramsey's problem while travelling from Denmark to Holland in 1948. He concluded that Ramsey's rule did need correction, as the optimality conditions should involve "Slutsky-Hicks *compensated substitution* coefficients not Marshallian *ceteris paribus* coefficients" (79). A week after his lectures at the University of Copenhagen, another coincidence happened to Samuelson while he attended the September Econometric Society meeting at the Hague: he heard Marcel Boiteaux give a paper on what seemed to him close to Ramsey (1927), but with results already corrected to involve the Slutsky-Hicks substitution coefficients. Samuelson then mentioned to Boiteaux the work of Ramsey, "a name he was not familiar with" but that he included in the references of his two papers that grew out of that presentation and were published in 1951 and 1956 (84). Samuelson ([1982] 1986) goes on to expound in details his own analysis of such issue that he developed during the year 1948-1949, which culminated with his memorandum for the United States Treasury titled "Theory of Optimal Taxation" and which became a central reference to the public finance economists who rediscovered and extended Ramsey's analysis in the late 1960s and the 1970s. Samuelson's memorandum remained unpublished until 1986 when the editors of the *Journal of Public Economics*, Tony Atkinson and Nicholas Stern, asked him to publish it without revision because it was considered to be "an important historical document which [the editors] thought should be generally available in its original form."<sup>1</sup>

For the economists rediscovering Ramsey's work on optimal taxation in the 1970s — who were also transforming the nature of analysis in public finance toward a formal general-equilibrium framework

---

<sup>1</sup>Editorial Introduction, *Journal of Public Economics*, vol. 30 (2), 1986: 135.

and have cast Ramsey’s contribution as a representative-agent model in this frame — Ramsey had no immediate impact on the profession because his mathematical sophistication was out of reach to the typical economist of the 1930s. Therefore, Ramsey’s contributions, both to taxation and to optimal saving (1928), needed to wait about forty years for a time that was ripe for his legacy, despite being published in one of the main economics journal of the time, the *Economic Journal*.<sup>2</sup> This portrait of Ramsey as a slumbering giant is exemplified by Feldstein (2002, xxviii): “the growing mathematical literacy of the economics profession led to a rediscovery of the Frank Ramsey’s (1927) theory of optimal excise taxes.”

By the time that Ramsey was inducted to the public-finance hall of fame,<sup>3</sup> economists like Baumol and Bradford (1970) did sketch notes on the history of optimal feasible taxation (or optimal departures from marginal cost pricing) in which they wondered that it was “difficult to understand why the propositions in question have achieved so little recognition by the profession” (277).

My goal in this article is to evaluate and enrich both Samuelson’s ([1982] 1986) and Baumol and Bradford’s (1970) narratives by paying attention to the changes that economics went through in the postwar period: not only its growing mathematization but also the comeback of utilitarianism in the so-called “new welfare economics” and the movement toward a general equilibrium analysis. In doing so I also analyze some issues important to understanding the context in which Ramsey (1927) was rediscovered, as for instance the precise part of Samuelson in the transmission of Ramsey’s name and ideas among public finance economists, how his unpublished memorandum became a central reference in this literature, and the alleged ignorance of John and Ursula Hicks of Ramsey’s work.<sup>4</sup>

In essence, it is a narrative about the stabilization of a normative general-equilibrium framework in public finance in which Ramsey was taken as a precursor greatly due to Samuelson’s writings and his compulsion for citing economists and telling his students stories about them. I start with a review of Ramsey’s original contribution and discuss if he had in mind a notion of a representative-agent model as present day economists believe he had (Section 1), followed by the evidence from articles available in JSTOR on the pattern of references to Ramsey (1927) and a discussion on whether or not Ramsey’s contribution to optimal taxation had received no immediate attention from the economics literature (Section 2). I then analyze the changes that happened both to welfare economics and to public finance that set the stage for the rediscovery of Ramsey (1927) as a representative-agent, general-equilibrium model with normative content (Section 3), and present my narrative on how this happened (Section 4). I close with some final remarks.

## 1 Frank Ramsey’s Contribution to Optimal Taxation

Frank Plumpton Ramsey (b.: Feb. 22, 1903; d.: Jan. 19, 1930), educated in mathematics at Winchester and at Trinity College, Cambridge, made important contributions not only to economics, but also to philosophy, mathematics, logic, and probability. Ramsey worked closely with Arthur Pigou and other Cambridge luminaries who created an aura of genius around him.<sup>5</sup>

---

<sup>2</sup>See Duarte (2009b) for an analysis of the impact of Ramsey’s growth model on the economics literature up to the early 1980s.

<sup>3</sup>Stern (2002, 335) referred to the following giants in the field of public economics: “The giants of the field — if we confine ourselves to those writing before 1950 — include Adam Smith, Jules Dupuit, Knut Wicksell, Alfred Marshall, A. C. Pigou, Frank Ramsey and Paul Samuelson. Those working in the last 30 years ... have stood on the shoulders of those giants.”

<sup>4</sup>This paper is thus not concerned with the question posed by Martina (2000): could the generalization of Ramsey’s result in public finance have happened earlier than it in fact did? His thesis is that the tools used by the literature of public finance that rediscovered Ramsey in the 1970s were already available “in the relevant Italian economic literature by 1916” (139).

<sup>5</sup>For biographical details on Ramsey and further references, see Duarte (2009a), who also shows that, in contrast to the view that Ramsey was a mathematician distracted a few times to solve economics problems, he did have an

What is the problem studied by Ramsey (1927)? As he clearly states in the opening sentence of his article: “a given revenue is to be raised by proportionate taxes on some or all uses of income, the taxes on different uses being possibly at different rates; how should these rates be adjusted in order that the decrement of utility may be a minimum?”

Ramsey’s conclusion is that uniform taxation does not maximize utility, but rather a tax scheme that reduces the production of all taxed commodities in the same proportion with respect to the benchmark case of prices equal to marginal costs: this becomes in the public finance literature later known as “the Ramsey rule” or “result” (or even “the Ramsey theorem”). Another way of interpreting Ramsey’s finding is that the government revenue requirement imposes deviations of prices from marginal costs, and such deviations depend on demand and supply elasticities. If demand or supply is highly elastic, it should be taxed little as small price variations produce large effects of the quantity produced. Therefore, goods with elastic demand or supply should have prices close to marginal costs. On the other extreme, goods with highly inelastic demand or supply should be heavily taxed and, thus, they exhibit large deviation of price from marginal cost.

One question that emerges on Ramsey’s place in the Cambridge tradition of the time is whether or not he employed a representative-agent framework, i.e., the behavioural notion that agents may differ but act in a way that the aggregate choices are mathematically equivalent to the decision of one fictional individual or many identical individuals. Ramsey (1927) does not discuss to whom belongs the utility function he considers: if to a representative agent or to a social planner or policymaker. He simply states that “we denote by  $u = F(x_1 \cdots x_n)$  the *net* utility of producing and consuming (or saving) these quantities of commodities” (48), and he derives conditions “which make  $u$  a maximum.” Ramsey (1927) had a few passages in which he vaguely suggests that he may have considered a society composed of several individuals that he assumed to be identical: he presupposes that there are no “differences in the marginal utility of money to different people” (47), he talks about transfers “from individuals to the State, and then, in part, back again to rentiers and pensioners” (47), and, finally, uses the plural in a footnote in referring to the case in which the consumers’ utility is independent of the producers’ disutility (fn. 1, 49).<sup>6</sup> This may suggest that “the” utility function Ramsey considered could be that of a representative of these several private agents. However, it is also possible that it was just the utility function of a planner or policymaker. Despite this ambiguity, the literature on public finance that rediscovered Ramsey (1927) in the late 1960s and the 1970s believed that he attributed the utility function to a representative agent (see Section 4) — in a way projecting the representative-agent approach they used back to Ramsey’s work.

Given the evidence that both of Ramsey’s economic papers were part of a common research agenda (Duarte (2009a)), we can see whether his economic growth paper sheds any light on the issue of whose utility function Ramsey discussed in his taxation paper. Ramsey (1928, 543) started the paper considering the utility of an infinitely lived community composed of a constant number of members and asks: “how much of its income should a nation save” in order to approach a bliss point of its net enjoyment (the maximum obtainable rate of enjoyment)?

To answer this question Ramsey again conceived of a community composed of different members, and he ignored considerations about how consumption and labor are distributed among them. Moreover, he focused on a composite commodity and labor: “we neglect the differences between different kinds of goods and different kinds of labour, and suppose them to be expressed in terms of fixed standards, so that we can speak simply of quantities of capital, consumption and labour without discussing

---

economics research agenda born out of his collaboration with Pigou.

<sup>6</sup>The impression that Ramsey’s (1927) analysis focused on the special case of a community populated by identical individuals comes also from Pigou (1928b), the book from which Ramsey’s contribution seems to have emerged. In the chapter about differentiation in taxation (Part II, chap. IX), after presenting Ramsey’s result Pigou considers in section II the distributional aspects of taxation by relaxing the hypothesis of identical individuals made earlier in the book. So it is possible that Pigou asked Ramsey to analyze taxation and growth in the simple context of identical individuals, which he then extended in his 1928 book.

their particular forms” (543). When it comes to the utility function Ramsey is again not very explicit about to whom it is attributed. He clearly solves a planner’s problem, to use a current terminology, as he minimizes the integral over time of the deviations of the community’s utility from the bliss point, subject to the economy-wide resource constraint (which states that consumption plus investment is equal to total output). However, the community’s instantaneous utility function considered by the planner could, in principle, be that of a representative agent or it could simply reflect the planner’s tastes.

Kevin Hoover (2001, 83) argues that Ramsey (1928) used the utility function as representing “social preferences, without conjecturing how these might be related to the preferences of the members of society.” This same interpretation is also shared by Edmund Phelps both in his 1966 book (69-71) and in his 1967 article (264). On the contrary, Solow (1994, 49) maintains that Ramsey (1928) worked with a representative agent model, an interpretation shared by many present day economists. Gaspard (2003) correctly notes that “Ramsey does not try to justify the use of such macroeconomic functions [as aggregate utility and aggregate production functions], and *a fortiori*, he carefully avoids referring to any kind of aggregation procedure or ‘representative agent’ concept” (416).

I would like to suggest that Ramsey (1927, 1928) may have worked in a model with a representative agent, a notion that was already present in Marshall’s *Principles* (the notion of a representative firm) and in Pigou’s *A Study in Public Finance*, and with which he was familiar.<sup>7</sup> Hartley (1997) warns us that Marshall had a very limited notion of representative agent when compared to the currently prominent concept. In modern economics, representative agent is supposed to aggregate individual functions. In contrast, Hartley (1997, 13) notes that Marshall’s abstract representative firm was used “to explain how an industry with diverse firms could generate a single market price” and that Marshall was reluctant to apply this concept to any other purpose. Despite having proposed a very limited notion of a representative agent, Hartley (1997, 12-16) shows that Marshall was heavily criticized at the time and that Pigou and Robertson, nonetheless, defended that notion.

In what follows I want to entertain the possibility that Ramsey went a step further than Marshall and have worked out an economic analysis in a simplified framework of identical individuals or one in which only aggregate variables matter. In order to do so, I present three main arguments or evidence. The first is that Ramsey (1927, 1928) constructed an analysis valid for an average situation or agent. As already mentioned, in both articles Ramsey ignored distributional considerations by assuming that agents were identical (1927 article) or that only aggregate consumption and labor (average or composite goods) are arguments of the community’s utility function (1928 article).

Moreover, Ramsey (1928) goes back and forth between a community and an individual utility function, which suggests that he may have thought this individual to represent some sort of average of the many members of the community — though it is quite possible that this was a rhetorical device used only to explain his argument. He structures the sections of this paper from the simplest to the more “general problems” (545). In section II Ramsey (1928) extends his model from a community’s utility function with no discounting, developed in the first section, to “the case of an individual who only lives a finite time” (549, 551) and to the case in which future utilities are discounted.

The second piece of evidence that Ramsey may have worked in a representative agent framework comes from Allyn Young’s (1929) indirect criticism of Ramsey (1927) and from Ramsey’s correspondence with Harrod about it. Allyn Young wrote reviews of both Pigou’s *Wealth and Welfare* (1912) and *A Study in Public Finance* (1928). In the latter review, Young (1929) spends most of the article discussing taxation and, mainly, the issue of differentiation in taxation supported by Ramsey (1927) and Pigou (1928b, Part II, chap. IX). Young cites and criticizes Ramsey in his review of Pigou’s book: for Young (82), “Mr. Ramsey’s theorem does not seem to have much practical significance.” In

---

<sup>7</sup>For a historical account on the representative agent in macroeconomics see Hartley (1997, esp. Ch. 2), who mentions that Marshall’s notion of a representative firm was later incorporated in Pigou’s (1928a) notion of “the equilibrium firm.” However, Ramsey appears nowhere in Hartley’s book.

constructing his criticism, Young (1929, 80-82) considers a “simple apparatus” with a “representative consumer,” among other things. He contradicts Ramsey (1927) and concludes that uniform taxation of all commodities is the desirable taxation scheme, in terms of consumer welfare.

In the already mentioned letter to Harrod of March of 1929 (the same month when Young’s review was published), Ramsey shows his disagreement with Young and uses Young’s expression “representative agent,” that he understood to mean an average consumer: “No I don’t think Allyn Young’s thing is any good; he seems to be in an awful muddle. (...) it doesn’t contradict what I said, as if the tax goes back to the average consumer, the production of all commodities is diminished in the same proportion, namely not at all. (...) The economic world is supposed so rigid [by Young] that the problem of differentiation disappears. But how this makes a criticism of Pigou or me I don’t see; I think he [Young] supposed that it was contrary to what we said but it isn’t” (Besomi (2003, 104-105)).

Finally, the last piece of evidence comes from Pigou, Ramsey’s mentor and interpreter. In a footnote in the second edition of his public finance book, published in 1929, Pigou cites Ramsey (1928) and writes that “Mr. Ramsey has shown how to determine (...) how much of their incomes people of different incomes would need to save in order to maximise satisfaction” (fn. 1, 123). Clearly, Pigou understood that Ramsey’s (1928) analysis was applied to the individual level, which implies that Ramsey’s equations describe the behavior of a representative of these individuals with different levels of income. As Pigou (1928a) was an influential book throughout the 1930s and one of the first to cite and interpret Ramsey (1927), it is clear its role in transmitting Ramsey’s ideas to later generations. Years later Pigou (1947, 180) again interprets Ramsey’s result to characterize the behavior of the representative man.

In summary, the best we can claim based on the evidence we have is that Ramsey did not clearly discuss any aggregation procedure. It is unclear if he purposely avoided considering this issue or if he simply solved a very particular case of a representative-agent model closer to the modern understanding of the term than to Marshall’s (no matter how unrealistic he may have considered it to be). I suggest that Ramsey may have had in mind such a particular case. Despite Ramsey’s own ideas, the crucial aspect is that economists who rediscovered Ramsey in the postwar period considered him to be a predecessor of their representative-agent framework.

As previously mentioned, Ramsey’s (1927) result was first cited by Pigou (1928b), straight after its publication. While discussing the issue of differentiation in taxation between different sorts of expenditure, Pigou (1928b, 126) mentions that “Mr. Ramsey, of King’s College, Cambridge, has examined the problem by mathematical methods and has obtained a very interesting solution”: “that the *optimum* system of proportionate taxes yielding a given revenue will *cut down the production of all commodities and services in equal proportions*. This is true not merely of independent commodities, but also of commodities of complementary or rival demand or of complementary or rival supply.” Pigou then discusses verbally the elasticity version of Ramsey’s result.<sup>8</sup>

Let us now have a look on how often Ramsey (1927) was mentioned in economics and finance journals up to the early 1980s, with especial attention to the period prior to Samuelson’s memorandum for the United States Treasury (1951).

## 2 References to Frank Ramsey in JSTOR

I obtained references (with or without full bibliographic citation) to Ramsey in the period 1927-1982 by searching all economics and finance journals available in JSTOR for “Ramsey” and categorizing these references in four groups (economic growth, taxation, expected utility and subjective probability,

---

<sup>8</sup>It was just in the third edition of his book, published in 1947, that Pigou emphasizes and presents the mathematical formulation of the elasticity version of Ramsey’s result, as well as discusses its limitations more thoroughly.

and other).<sup>9</sup> Out of the five hundred and thirty four references to Ramsey, about twenty-one percent related to his taxation paper. Two aspects are worth exploring here: first, who were the economists mentioning Ramsey (1927) most frequently and in which journals, and second, the temporal distribution of this data.

With respect to the first aspect, we observe in Table 1 that Samuelson was the second economist who referred most to Ramsey’s taxation article, and that references to this article appeared mostly in the *American Economic Review*.<sup>10</sup>

Table 1: References to Ramsey (1927) by Author and Journal (1927-1982)

Top-5 Authors	$(t; p)^{(*)}$	Top-5 Journals	$(t; p)$
J. Stiglitz	(4; 4%)	AER	(29; 25%)
P. Samuelson – J.	(3; 3%)	Rev. Ec. Studies	(9; 8%)
Mirrlees – M.		Economic Journal – JPE	(4; 4%)
Feldstein – P.		QJE – Econometrica	(3; 3%)
Diamond			

(\*) *Note:*  $(t; p)$  indicate respectively the total number of references by an author or in a journal and as percentage of the corresponding total. Thus, Samuelson cited Ramsey in 3 articles, which make up 3% of all articles (whether by Samuelson or not) that cite Ramsey. If a row has multiple entries, these numbers correspond to each author or journal in it and not to their sum.

The JSTOR data presented in Figure 1, references to Ramsey (1927) as percentage of all economics and finance articles published in each year, seem to support the impression shared by public finance economists of the 1960s and the 1970s that aside from Pigou, his mentor and supporter, Ramsey’s contributions to taxation had no significant immediate impact on the economics literature. Up until the end of the 1950s, only six articles on JSTOR mentioned Ramsey in the context of optimal taxation (in 1929, 1933, 1940, 1956, 1957 and 1958).

References (not necessarily accompanied by full citations) to Ramsey’s contribution to taxation up to 1970 appear in: Young (1929), Fraser (1933), Holden (1940), McKenzie (1956), Rozental (1957), Samuelson (1958, 1962, 1964), Bishop (1968) (who followed closely Musgrave (1959) and cited Hicks (1947), but not Samuelson ([1951] 1986)), Stiglitz (1969), Kolm (1969), and Samuelson (1969). From all these papers, the only three that do not fully cite Ramsey (1927) are Samuelson’s 1958 book review, his 1964 discussion and his 1969 article.

While Ramsey was not a sleeping giant in the economic-growth literature (Duarte (2009b)), the same is not clear with respect to his contribution to optimal taxation: nonetheless, even if Ramsey (1927) was not much cited in economics and finance journals he was cited in one of the main public finance books of the 1930s and early 1940s, Pigou (1928b).

Moreover, from the three “waves” of rediscoveries of Ramsey documented by Duarte (2009b), the one on public finance was the last, after that on expected utility and subjective probability (1950s), and that on economic growth (late 1950s and early 1960s). This means that the image of a genius ahead of his time was already known to some of the economists who have helped induct Ramsey to the public-finance hall of fame. For instance, Martin Feldstein knew Ramsey’s contributions to economic growth and to subjective probability before he contributed to the public finance literature where Ramsey played a role. In the same way, Peter Diamond, Joseph Stiglitz and Avinash Dixit

<sup>9</sup>See Duarte (2009b) for details on this search.

<sup>10</sup>From 1972 onwards the data showed here underestimates the references to Ramsey’s in the context of public finance, as the main journal of the field, *Journal of Public Economics*, created in 1972, is not available in JSTOR.

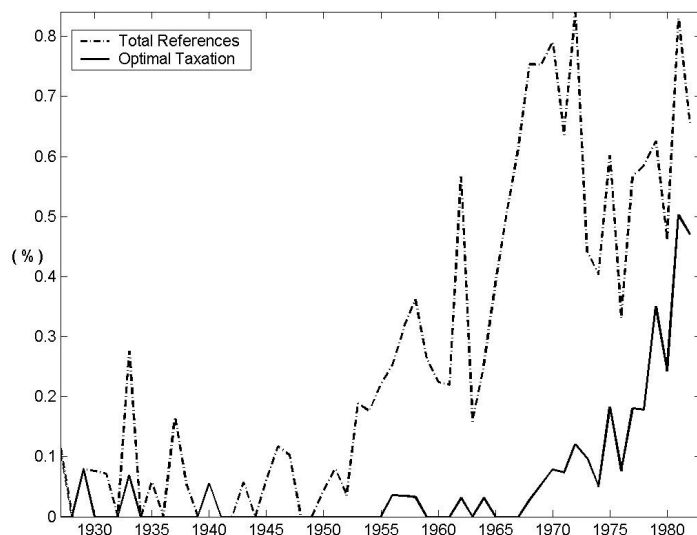


Figure 1: References to Ramsey over time (1927-1982)

were all familiar with Ramsey in the growth literature before their seminal contributions to optimal taxation.<sup>11</sup>

Finally, Paul Samuelson appears as an active promoter of Ramsey’s name in general: while he mentioned Ramsey’s taxation analysis in print for the first time only in a 1958 article, his memorandum for the Treasury came to be a central reference to those extending Ramsey’s 1927 work in the 1970s. He also helped propagate the romantic view of Ramsey as a genius who made important contributions to economics, even if too advanced for his time, and thus echoed Keynes’s ([1933] 1972, 335-336) own judgement. This way, therefore, both Keynes and Samuelson, besides Pigou, made Ramsey a pioneer whom many public finance economists would like to cite.

The rediscovery of Ramsey (1927) in public finance as seen by leading economists of this sub-field is the main point explored in the next section. Public finance combines economic theories with normative statements. Thus, the better way to appreciate historically that rediscovery is to consider also how welfare economics treated normative statements from the late 1930s onward.

### 3 Redefining Boundaries and Setting the Stage

After the Second World War, economics was transformed by a process of formalization and by the increasing dominance of general-equilibrium models (see Morgan and Rutherford (1998) and Weintraub (2002)). At the same time and also reflecting these transformations, subdisciplines redefined their boundaries and methods. Public Economics, defined as “the positive and normative study of government’s effect on the economy” (Auerbach and Feldstein (1985, xv)), is an example.

A first clear redefinition of the boundaries of public economics can be associated with the publication of Richard Musgrave’s (1959) book, which then became a major reference in this field for the new generation of economists who rediscovered and generalized Ramsey’s analysis. One of the main points stressed by Musgrave (1959, 51) was the need for a general-equilibrium approach to analyze the

<sup>11</sup>Diamond received his Ph.D. from the M.I.T. in 1963 with a thesis on growth written under Robert Solow, F. M. Fisher, and Paul Samuelson. Stiglitz and Dixit also obtained their Ph.D. degree from the M.I.T. in 1966-1967 and 1968 respectively, and were students of Samuelson as I shall discuss later.



problems of the public sector. In his book, which grew out of his Ph.D. dissertation, Musgrave studied the interactions among all sectors of the economy avoiding as much as possible resort to a high level of formalization. He intentionally used only graphs and simple algebra in his economic theory of the public sector, as he clearly stated in the preface (viii-ix).

Musgrave (1959) discusses, among many things, the so called optimal taxation problem, a long-standing concern among economists: how the public sector finances its activities to impose the least cost to society. Musgrave's (1959, v) intention was to go beyond what he calls traditional literature in public finance, which focused mainly on taxation and considered public expenditures only to a limited extent.

For Musgrave, budget policy (fiscal policy) must be evaluated along three main dimensions: first, the allocation of real resources in the economy that results from the fiscal policy; second, the distribution of income and wealth that policy generates; lastly, the way that the policy contributes to overall economic stability, understood as price-level stability and full employment. Only by considering these three criteria (resource allocation, income distribution, and economic stabilization) can economists characterize the optimal budget policy. Conflicts may arise between the three criteria mentioned. For example, a policy that promotes economic stability might produce a misallocation of resources or an undesirable wealth distribution. Therefore, public finance economists must combine economic theory with some value judgement in order to characterize and possibly implement an optimal fiscal policy. The notion of optimality used by Musgrave (1959, 54) was that of avoiding unnecessary interference with the market economy, or of neutrality. The word neutrality reappears in Musgrave's book in the discussion of optimal taxation (141) as a synonym for greatest efficiency or least burden.

From Musgrave, we see that taxation was understood to introduce distortions. The key idea was that of avoiding excessive distortions. This idea is very much in line with Ramsey's (1927) analysis, in which lump sum (non-distortionary) taxes are not available and the optimal tax scheme is the one minimizing utility losses. Later, as I shall discuss, public finance economists would describe this as the theory of second-best and link it to Ramsey.

### 3.1 From the Old to the New Welfare Economics

Talking about how to avoid excess burden was one among different ways economists discussed alternative policies in the field of welfare economics. Thus, I would like to analyze the different conceptions of optimal policy and the state of the art in welfare economics. With this, I hope to shed some light on how public finance economists working in the 1960s and the 1970s redefined once more the boundaries of their field and then constructed arguments about the theory of optimal taxation (as discussed in the next section).

Samuelson ([1947] 1983) distinguished what he denoted old and new welfare economics, in spite of claiming that "in a real sense there is only one all-inclusive welfare economics" (249). Similar distinctions were made earlier by Bergson (1938, 310, 327-328), who separated Pareto, Barone, and Abba Lerner from "the Cambridge economists" (a generic term meant to include not only Cambridge economists like Marshall and Pigou but also non-Cambridge economists as Edgeworth), and made by Hicks (1939) and Lange (1942). Samuelson later repeated that separation several times. The distinction between an old and a new welfare economics became widespread among economists since the 1950s.

The old welfare economics referred, according to Samuelson ([1947] 1983), to the basic understanding that the welfare of a society corresponds to the sum of the individual welfare of each of its constituents. The gist here is the assumption that the welfare of different individuals are commensurable and, thus, can be summed up into a social aggregate. The crucial characteristic of the old welfare analysis was the interpersonal comparison of utility, which was harshly criticized by Lionel Robbins ([1932] 1935, 1938) in his quest for keeping "philosophy in its proper place" by "delimiting

the neutral area of science from the more disputable area of moral and political philosophy” (Robbins (1938, 639) and Robbins([1932] 1935, 151)).<sup>12</sup>

Robbins’ attack on interpersonal judgments was taken seriously by the new welfare economists (Bergson, Samuelson, Little, Lerner, Scitovsky, among others), who recognized Pareto, Barone, and Hotelling as their predecessors. The key move effected by these economists was not to deny interpersonal comparisons of utility but rather to sidestep them as unnecessary in their scientific framework.

On the one hand the new welfare economists agreed that Robbins is correct in stressing that ethical statements do not share the same epistemological status as the scientific ones (Samuelson ([1947] 1983, 220)). On the other hand, some of the new welfare economists agreed that sidestepping interpersonal judgments does not imply that there is no room for any kind of ethical assumptions in science. For example, Samuelson ([1947] 1983, 249) considers a “delusion” Robbins’ dictum that welfare economics is inadmissible in the body of economic theory. He argues that discussions about production and exchange efficiency do not require interpersonal comparisons and are, thus, a valid part of economic theory. In a slightly different angle, Musgrave (1959, 108-109) supports that “interpersonal utility comparisons can be made in a meaningful fashion” as after all individuals are not that different with respect to their income utility.

Therefore, the new welfare economists like Bergson and Samuelson, and also Musgrave, intended to draw the demarcation line between science and ethics so as to include general and uncontroversial normative assumptions into the scientific side of economic realm. In this sense they built a new scientific ethic in which, to use Davis’s (2005, 195) words, normative judgments were seen almost as so “insignificant as to permit them to be reasonably considered ‘quasi-positive’.” This way they designed a border that allowed the new welfare economics into the main body of economic science (they either sidestepped as unnecessary or denied the old interpersonal comparisons of utility).

The Bergson-Samuelson approach takes “as a starting point (...) a function of all the economic magnitudes of a system which is supposed to characterize some ethical belief”. The beliefs of a specific community are exogenously given and no scientific enquiry into their origins is possible in economics for Samuelson and other new welfare economists. In this sense, they met Robbins’ “requirement that the economist take the values of the community as data” (Bergson (1938, 323, fn. 2)).

Given the beliefs that define a social welfare function, the new welfare economists assumed “more general and less controversial” ethical assumptions that imposed few requirements on that function: a clear definition of “better,” “worse,” and “indifference” among social states; transitivity of social preferences (if situation  $A$  is socially preferred to  $B$ , and  $B$  socially preferred to  $C$ , then it should be the case that  $A$  is preferred to  $C$ ); and a social welfare function that can only order different social states, in connection with which “it may or may not be convenient to work with (any) one cardinal index or indicator” (Samuelson([1947] 1983, 221, 249)).<sup>13</sup>

With respect to the first ethical assumption, a social situation  $A$  is said to be better than another,  $B$ , if at least one individual is better off in  $A$  than in  $B$  and no one else is worse off. This optimal situation became to be known as “Pareto-optimum.” For the new welfare economists no one could object to defining a social improvement as a situation in which at least one individual is better off and no one else is worse off. (Notice how this conception sidesteps the need of interpersonal comparisons of utility because being better or worse off refers solely to one individual’s own welfare.)

Incorporating general ethical assumptions into welfare economics brought with it as a cost the fact that the maximization of the social welfare function (subject to the conditions of production and of equilibrium in the different markets) delivers only a set of necessary, but not sufficient, conditions for the optimum. Moreover, in the case of an economy with more than one agent, these conditions

---

<sup>12</sup>Robbins would later be closely associated with the idea of what Davis (2005) called extreme value neutrality: the idea that there exists a clear line dividing positive and normative arguments, or separating economics from ethics.

<sup>13</sup>The social welfare function is also general enough to avoid the need of assuming any particular curvature of the indifference loci.

describe only the set of Pareto-optimal situations (the so-called generalized contract locus), but they cannot pin down the most preferred situation among these infinite optima, which can be defined only by considering income distribution issues. As a consequence, “the production and exchange conditions which constitute the ‘new welfare economics’ are included in the old, but are themselves incomplete” (Samuelson ([1947] 1983, 246)).<sup>14</sup>

Moreover, the new welfare economics also left the door open for economists to assume more restrictive ethical postulates. Such restrictions were not required for deriving the main results of welfare economics, but could be assumed if economists felt comfortable in doing so. Therefore, the old utilitarian social welfare function, defined as the sum of the individual welfare of each member of a society and based on interpersonal judgements, found a niche in the new welfare economics and it is still used nowadays.

Thus far, I have analyzed how in the postwar period the field of public economics, and its sub-field of public finance, first redefined its boundaries and emphasized a general equilibrium approach to its problems, though, as exemplified by Musgrave’s 1959 textbook, not necessarily a formalized one. Secondly, this field also incorporated the changes in welfare economics that started in the first half of the twentieth century and the new status that normative statements clearly acquired after World War II. These two broad movements are important because they set the stage on which the new generation of economists rediscovered Frank Ramsey in the public-finance literature.

As already mentioned, Musgrave’s 1959 book became then the main reference in the field of public economics — or the “bible” of this field, according to Feldstein (2002, xxvii), which has displaced Pigou’s treatise (Samuelson (1969, fn. 2, 99)). The new generation of economists who used this book in their graduate training was responsible for redefining once more the boundaries of public economics in the 1970s. Since that time, rigorous formalization blended with the use of new econometric techniques became the benchmark for a scientific contribution to this field, an opinion shared by the main figures of the new generation who created the *Journal of Public Economics* in 1972.

According to Feldstein (2002, xxix), the late 1960s and the 1970s witnessed not only an empirical revolution in public economics with the public availability of new (micro) data sets, “high speed computers, reliable econometric software, and large machine-readable data sets,” but also “the addition of sophisticated econometric techniques to the standard tool kit of graduate students.” It was a period in which optimum taxation was a hot topic in public finance. Another important characteristic of this period is that there was a great concern about making “realistic” assumptions on taxation. The new generation of public-finance economists had clearly in mind that “it is not possible in practice to levy [non-distortionary] lump-sum taxes” (Baumol and Bradford (1970, 265)).<sup>15</sup> Therefore, given that the Pareto-optimal (undistorted) equilibrium is not a practical reality, they focused on how distortionary taxes should be designed so as to improve economic efficiency.

In other words, the new generation of public-finance economists studied the so-called “theory of the second best” which was “very much in the air in the mid 60’s” when these economists received their graduate training (Diamond (2002, 311)). Samuelson ([1982] 1986, 157), as already mentioned, referred to the second-best optimum as the “theory of the feasible first best.”<sup>16</sup> As epitomized by Sandmo (1976, 38):

But it seems definitely sensible to admit the unrealism of the assumption that the public

---

<sup>14</sup>This same idea was already clearly present in Samuelson’s welfare discussion of international trade. De Marchi (2003) shows Samuelson’s long-lasting struggle for finding a correct graphical representation of Pareto optimal equilibria and the gains from trade.

<sup>15</sup>Other ways used to justify the analysis of distortionary taxes were: “Although lump sum transfers of the kind required for full optimality are not feasible today, commodity and income taxes can certainly be used to increase welfare” (Diamond and Mirrlees (1971a, 8)); “Most economies make extensive use of differential (distortionary) taxes” (Stiglitz and Dasgupta (1971, 151)).

<sup>16</sup>This idea of “the economics of the feasible first best” has appeared earlier in Samuelson (1958, 1962, 1969, 540; fn. 1, 828; 121; 123). It was also present in Baumol and Bradford (1970, 280).

sector can raise all its revenue from neutral or Pigovian taxes, and once we admit this we face the second-best problem of making the best of a necessarily distortionary tax system. This is the problem with which the optimal tax literature is mainly concerned.

To sum up, the new generation of public-finance economists analysed the optimal taxation problem in a formal general equilibrium model, by assuming in general an individualistic utilitarian social welfare function and characterizing the second-best solution. For that, these economists took economic efficiency as their foremost scientific ethic.<sup>17</sup> It was in this context that they rediscovered Ramsey's 1927 contribution to the theory of optimal taxation.

## 4 Awakening the Giant

According to economists who contributed to the analysis of optimal taxation, the history of how they rediscovered Ramsey (1927), as briefly told by Samuelson (1964, 94-95) and echoed by Baumol and Bradford (1970, 277-280), runs as follows.<sup>18</sup> Ramsey's contribution was mentioned only in the various editions of Pigou's *A Study in Public Finance* (1928, 1929, 1947). Harold Hotelling (1932, 1938) discussed, in a different context from Ramsey's, the issue of marginal cost pricing with no mention of the latter.<sup>19</sup> The elasticity version of Ramsey's theorem "was independently approached by Ursula Hicks in her 1947 book on the same subject" with an "elementary graphic argument" (Baumol and Bradford (1970, 278)). However Ursula Hicks does not mention Ramsey. Then, in 1951, two major contributions were made independently: the first, by Marcel Boiteaux and the second by Paul Samuelson (who cites not only Ramsey (1927) but also Boiteaux (1951) and Hicks (1947)), in the already mentioned memorandum for the United States Treasury. It is important to mention that Boiteaux (in his 1951 and 1956 articles) does not cite Ramsey (1927), while Samuelson ([1951] 1986) does.

The next major step in this story, as attested by public-finance economists, comes with Diamond and Mirrlees (1971a,b) who finally formulated the optimal taxation problem in a general equilibrium framework. This paper is, according to Samuelson ([1982] 1986, 179, fn. 9), "the spring from which all modern discussions flow."

According to Paul Samuelson's ([1982] 1986) chapter in the history of Ramsey's contribution to optimal taxation summarized in the introduction of the present paper, it was Gelting, in 1948, who made Samuelson think about this problem that three eminent economists have independently approached: Ramsey, Hotelling and Hicks. A week later, Samuelson talked to Boiteaux about Ramsey at the European meeting of the Econometric Society (September 22-25, 1948) at the Hague. Boiteaux "was part of a Paris renaissance in economic theory associated with people like Pierre Massé, Maurice Allais, Gerard Debreu, Edmund Malinvaud and others" (Samuelson ([1982] 1986, 164)) and did not know Ramsey's 1927 article. Samuelson ([1982] 1986, 179), following Robert Merton's theory of the simultaneity of scientific discovery, concluded his story by writing: "it is a pity that Hotelling, the two Hicks's [John and his wife Ursula], and Boiteux seem not to have been aware of Ramsey's 1927 analysis. No fault of theirs. But I do reproach myself that for over three decades I did not publish my lectures and memoranda. It is a sin not to publish."<sup>20</sup>

---

<sup>17</sup>Economic efficiency was not the only scientific ethic among public-finance economists, who also extended their theory to include distributional concerns, for example.

<sup>18</sup>The same picture comes out of Samuelson's ([1982] 1986) account and those by other economists.

<sup>19</sup>Besides the references mentioned in the previous footnote, Samuelson (1960, 23) repeats the argument that Hotelling derived the optimal pattern of excise taxes without knowing the analysis of Ramsey (1927) and Pigou (1928b).

<sup>20</sup>Samuelson seems to have always liked Merton's theory about independent scientific discoveries. For example, his account of the discovery of the balanced-budget multiplier follows the same lines of several people (including himself) independently establishing the same result (see Samuelson's and other articles in the spring issue of the *History of Political Economy*, vol. 7 (1), 1975).

There are some problems with the standard narrative that Ramsey (1927) was basically neglected up to Samuelson's 1951 memorandum and entered the mainstream of public finance with Diamond and Mirrlees (1971a,b). First, it is unlikely that John Hicks, in Britain, was unaware of Ramsey's result published in the *Economic Journal* and cited not only by Pigou (1928b), the major reference of this field at the time, but also by Allen (1938), a key book on mathematical economics cited by Hicks in his *Value and Capital* (1939) (which Hicks wrote in the period 1935-1938 that he spent at the University of Cambridge) and whose author Hicks closely interacted with in the early 1930s.<sup>21</sup>

The story about Hicks unpublished derivation of the equiproportional reduction in the production of the taxed goods was already mentioned by Samuelson (1964, 95) and repeated by Baumol and Bradford (1970, 279). The latter authors, in turn, wrote and asked Hicks about it. Hicks replied that he did not recollect the matter. However, based on Samuelson's suggestion (Baumol and Bradford have just quoted Samuelson (1964) in their letter), Hicks then tells that he stayed a few days with Hotelling at Chapel Hill in December 1946.<sup>22</sup> Hicks reported to Hotelling he had worked out the equiproportional result by minimizing the deadweight loss (approximated as the area of a triangle) subject to the revenue requirement faced by the government. Hicks continues: "I remember [that Hotelling] told me I ought to publish this, but I didn't — mainly, I suppose, because I was conscious of the qualifications to which Samuelson alludes in his paper, and which, if I had set them out in my style, would have whittled away the result so near to nothing" (Baumol and Bradford (1970, fn. 20, 279-280)).

Therefore, the alleged ignorance of John Hicks about Ramsey is hard to establish, as he seems to have written a draft with a proof of Ramsey's result cast in terms of minimizing deadweight loss, a partial-equilibrium approach that was under the attack of new welfare economists like Samuelson, who advocated general-equilibrium analysis. Moreover, Hicks believed, as he wrote in the preface to *Value and Capital* and in his account of his formation (Hicks (1984, 287-288)), that "theory should be 'the servant of applied economics' " and that "theory gives one no right to pronounce on practical problems unless one has been through the labour, so often the formidable labour, of mastering the relevant facts." Hicks, together with Hayek, Roy Allen, Abba Lerner and the later Ursula Hicks, among others, was a member of the "Robbins Circle" at LSE (Hicks (1984, 282)). Hicks (1982, 3) recollects that the members of this group "were not, at that stage, very interested in the welfare characteristics of the [free market or competitive] equilibrium; 'equilibrium is just equilibrium,' as Robbins ([1932] 1935, 127) said." These beliefs may explain partially why John Hicks seems not to have been impressed by Ramsey's work.

A second problem with the standard narrative relates to the absence of a reference to Ramsey (1927) in Ursula Hicks's 1947 book, usually taken to mean that Ramsey had no impact on economics and that his ideas were independently developed by other economists over time. Such absence may be understood in light of her intentions in the book, which was part of a series of introductory economic handbooks (*Cambridge Economic Handbooks*) planned initially by Keynes and later edited by Robertson, and also by her membership to the Robbins Circle: public finance was a growing field in terms of its scope and her focus was on "problems of financial administration and accounting." She continues (xi): "This difference in emphasis, as compared with the traditional make up of books on Public Finance, is quite deliberate. As the economic functions of government expand, the technical aspects of finance, of public accounting and of the control of expenditure, assume a new importance." To economists involved in the "administrative machine" of public policy, a graphic argument of the

<sup>21</sup>Hicks (1984, 286-287) alerts his readers that "[*Value and Capital*] is not at all a Cambridge book; it is a systematisation of the work I had done at LSE (...) [and it] got distributed throughout the world before the War broke out." Weintraub (1991, esp. chap. 2) provides a context to reading Hicks contribution.

<sup>22</sup>Hotelling moved in 1946 from Columbia University, where he had worked since 1931, to the University of North Carolina at Chapel Hill as a professor of mathematical statistics. At UNC-Chapel Hill Hotelling spent the rest of his career until his death in 1973. See Arrow and Lehmann (2005).

elasticity argument for the incidence taxation seemed more appropriate in Ursula Hicks' eyes than Ramsey's demonstration (that, again, she may have been unaware of, but this is hard to prove). Hicks (1947, 171, 180) hints at her predilection for non-formal arguments when, in the same chapter discussing the incidence of taxation, she refers to Hotelling's (1932) analysis but describes in words his main points. Moreover, her analysis on taxation was developed closely with John Hicks, and they may have shared the belief that theories should be the servant of data.<sup>23</sup>

The third major problem with the previous narrative on Ramsey (1927) is that Samuelson's memorandum becomes the central link between the new generation of public finance economists and Ramsey's contribution. Two questions then emerge and are not answered in the standard narrative. The first is the crucial question of how did the Samuelson memorandum become so widespread, as it was an unpublished document prepared for the Treasury and with a limited circulation?<sup>24</sup> A second question is how much its contents were shaped by the reality of the Truman administration, which started with an optimism about the "effectiveness of wartime price and wage regulation and appealed for its continuation for some reasonable period into peacetime" (Goodwin and Herren (1975, 11-12)). After Truman's re-election in 1948, there was a sense, among politicians and economists, of reforming the economy to prevent inflation. In 1950 the Korean War started and brought with it new military spending to be financed.

In a letter to the author, Paul Samuelson (2006) answered these questions. He starts by saying that his article for the Gelting *Festschrift* (Samuelson ([1982] 1986)) "pretty much exhausts the story of my discoveries concerning 1927 Ramsey second-best excise taxation." He then emphasizes that optimal excise taxation "was a topic mainly for the post-Pareto *micro* seminar rooms. That's why the prominent names were scholars such as Ramsey, Pigou, Hotelling, Hicks, Boiteaux, Allais, ..., scholars little associated with U.S. macroeconomists such as Hansen, Tobin, Heller and Okun. Being myself both a micro and macro nerd, if I allocated my budget of energy between these distinguished activities, my Ramseying would have been debited to the micro budget."

With respect to the motivations of his 1951 memorandum, Samuelson (2006) suggests that it may have been written as a response to Vickrey's Ph.D. thesis, which became his 1947 book:<sup>25</sup>

After the 1945 peace, Frank Boddy, Joe Pechman and Walter Heller recruited me and some other economists to consult for the Treasury. (The last time I saw Henry Simon[s], my admired Chicago mentor, was at such a Treasury meeting — just prior to his suicide.)

Mostly I contributed thoughts about macro policies I think. However, Treasury's Bill Vickrey at that time wrote a remarkable Columbia Ph.D. thesis outlining for Puerto Rico an "ideal" tax system. I think I wrote out for the Treasury some pros and cons concerning Vickrey's book. And that may have motivated Boddy to suggest I write a brief memo[ramandum] on ideal Ramsey excise taxing.

Samuelson's account of the rediscovery of Ramsey is, thus, a rational reconstruction of the discussions going on in the "post-Pareto *micro* seminar rooms." Nonetheless, he leaves some room for an understanding of his memorandum as a response to practical concerns of Treasury members. How-

---

<sup>23</sup>Ursula Hicks (1947, xiii) writes that "much of the theory of tax incidence (...) I have drawn heavily on [John Hicks'] published work, and still more heavily on his time for innumerable discussions of difficult points." On the other hand, John Hicks (1984, 287) states that between roughly the postwar years before 1960 he "was also much engaged in other activities, which sprang initially from Ursula's work in Public Finance, and from other work in that field in which I joined her."

<sup>24</sup>Samuelson was a consultant at the U.S. Treasury from 1945 to 1952 (and later, from 1961 on), as recorded by Lindbeck (1970, 342).

<sup>25</sup>Vickrey went to Columbia in 1935 as a graduate student and received a master's degree in 1937 and his Ph.D. in 1947 (Blaug (1999, 1135)). After finishing his master's, Vickrey worked for the National Resources Planning Board and the U.S. Treasury Department. During the war he designed a new inheritance tax for Puerto Rico and used this experience to illustrate his arguments in the book. Just for the records, Vickrey (1947) does not cite Ramsey (1927), but he does cite Pigou (1928b).

ever, Samuelson's final argument seems to be that his memorandum was a theoretical contribution to questions raised by such prominent economists as Ramsey, Pigou, and Boiteaux, among others.<sup>26</sup>

Another difficulty with the standard narrative is to understand how the public-finance literature moved from Samuelson's memorandum to Diamond and Mirrlees's seminal contribution. Samuelson (1964) sketches the main points of the history of Ramsey's rediscovery taken up by Baumol and Bradford (1970), who became the first to construct such an historical account that then shaped how the actors of the optimal taxation literature understood the development of their own research area. Bradford and Baumol did have access to Samuelson's memorandum, as a copy of it can be found in the Baumol Papers at Duke University.<sup>27</sup> In fact, the published version of the memorandum was a transcription of Bradford's copy, as explained in the editorial introduction in the *Journal of Public Economics* (1986).

In this move from Samuelson's memorandum to Diamond and Mirrlees (1971a), Musgrave (1959), the bible of the new generation of public finance economists, played no crucial role. Musgrave (1959, 148-149) reserved to Ramsey only a very critical footnote in which he labels Pigou's and Ramsey's equiproportional result as arrived at "within the framework of the old welfare economics of interpersonal utility comparison" and as belonging "in the welfare view of the ability-to-pay approach."<sup>28</sup> Musgrave's view was then criticized by Bishop (1968, fn. 7, 212), who in turn cited Ramsey (1927).

Baumol not only sketched a history of the literature on optimal taxation with Bradford, but he also considered both of Ramsey's major contributions to economics worth reprinting as a scarce work on political economy in his 1968 book with Goldfeld, which would, according to Viner (1968), "become a standard text for the profession." This was a project to reprint hard to find articles and to translate into English articles published in languages like French, Italian, and Spanish. It seems to have started in 1961 and Robert Dorfman helped select the papers reprinted in the book (Baumol and Goldfeld (1968, xi-xii)). Dorfman read and liked the two papers by Ramsey and suggested both be reprinted (Baumol (undated)). About Ramsey's article on taxation he reported: "Include, unless it has been republished in 'The Foundations of Mathematics and Other Essays.' (I don't have a copy at hand.) One of the few brilliant essays in the theory of taxation and, again, mathematically admirable." In the preface preceding the reprint of Ramsey's growth model, Baumol and Goldfeld (1968, 125) emphasize the view of Ramsey as a precocious genius with "primary interests (...) in philosophy and mathematical logic." The authors also quote Keynes' romantic description of Ramsey in his obituary note. Even though no explicit reference to Baumol and Goldfeld's book is to be found in the papers rediscovering Ramsey in public finance in the late 1960s and the 1970s, two things are noteworthy: first, that in the 1960s Ramsey's contributions were considered to be scarce works and precursors of mathematical economics; second, that this opinion was held by Baumol, among others, who was about to write his paper with Bradford in which they echoed Samuelson's account of the rediscovery of Ramsey (1927).

With respect to the papers in public finance that rediscovered and extended Ramsey's taxation result in the 1970s several did cite it: Dixit (1970) cites Ramsey (1927), Samuelson's 1951 memorandum

---

<sup>26</sup>Rozental (1957, 421, and references therein), guided by Walter Heller (University of Minnesota at the time), gives a portrait of the interest in excise taxes in the 1950s in part as a reaction to practical fiscal concerns. He describes the situation as: "the growing concern with the pre-eminence of income taxation in the federal tax structure (...) led to speculation about the 'limits of tax capacity' and resulted in a pressure to re-examine the whole tax system, often with the avowed intention of shifting the emphasis toward indirect taxes." It was in this context that, for example, Friedman (1952, 25) criticizes the "alleged 'proof' of the superiority of the income tax."

<sup>27</sup>*William J. Baumol Papers*. Rare Book, Manuscript, and Special Collections Library, Duke University. Writing Series, Box W2, folder "Optimal Departures from Marginal Cost Pricing (1970)." Bradford wrote notes (September 20, 1968) analyzing Samuelson's memorandum, which he sent to Baumol.

<sup>28</sup>It was for this reason that Ramsey (1927) is cited only in the classified references at the end of the book organized by Musgrave and Carl Shoup (in the section "Ability to Pay and Equal Sacrifice") and is not one of the important articles reprinted in this treatise, which was intended to provide a "more intensive treatment of a part of the field" of public finance and to be used by "the research worker and teacher" (Musgrave and Shoup (1959, v)).

and the 1968 working paper version of Diamond and Mirrlees (1971a,b); and Baumol and Bradford (1970) make a broad literature review and cite also Ramsey (1927), Samuelson's memorandum and his 1964 discussion, as well as Bishop (1968), but not Samuelson (1962, 1969), Stiglitz (1969), and Kolm (1969). Baumol and Bradford's (1970) historical account then became the main reference for the papers that followed it, particularly, Diamond and Mirrlees (1971a) and Sandmo (1976).

There is yet another aspect of the rediscovery of Ramsey in public finance that is not entertained in the standard narrative, which is the possibility of a Cambridge connection: of the iconic image of Ramsey being kept alive in Cambridge and transferred later to the United States. Diamond (Ph.D. MIT, 1963) visited Cambridge (Churchill College) in the academic year of 1965-1966 when he and Mirrlees became friends. Later, Diamond returned to Cambridge in the summer of 1967 when he actually started working with Mirrlees, who then visited MIT in March-July of 1968.<sup>29</sup> As reported by Diamond (2002, fn. 2, 311), his paper with Mirrlees "was presented in pretty much its final form at European and North American Econometric Society meetings in 1967, although publication was delayed by a combination of editorial delays and the difficulty of long-distance collaboration in those pre-email days."<sup>30</sup>

Another piece of evidence of a possible Cambridge connection through which the view of Ramsey as a genius with important contributions to economics may have been transmitted is given by Stiglitz's, Dixit's and Atkinson's that have been to Cambridge-U.K. or were there and went to the U.S. Stiglitz was a graduate student at MIT (1963-1966), having Samuelson as one of his professors. He obtained his Ph.D. from MIT in 1966-1967.<sup>31</sup> Stiglitz received a fellowship for the year 1965-1966 and he went to Cambridge. There, he was a student of Joan Robinson and Frank Hahn. Among the young lecturers and students that he met were James Mirrlees, Partha Dasgupta, and Tony Atkinson, who would become not only leading figures in the literature of public finance that rediscovered Ramsey, but also, in the case of the last two, co-authors of some of Stiglitz's papers on taxation.<sup>32</sup>

Dixit was an undergraduate student at Corpus Christi College, Cambridge (B.A. mathematics, 1965) and he received his Ph.D. from MIT in 1968, where he also was a student of Samuelson. Dixit (in Szenberg et al. (2005, 100)) recalls that "as memorable as [Samuelson's] research insights were his anecdotes about economists. Adam Smith, Ricardo, Marshall, Edgeworth, Keynes, Schumpeter, Irving Fisher, and above all Frank Ramsey, came alive for us in a way that taught us to respect the history of the subject and to appreciate the height of the shoulders of these giants, while at the same time making us smile at their human foibles." He then goes on to tell the story about Ramsey learning German in a week and saying that Kant almost got it right, a story that Samuelson ([1982] 1986, 178, fn. 8) has published and seemed to have a pleasure in telling to his students:<sup>33</sup> Dixit recounts that "Paul took special and visible delight in telling this story, clearly recognizing in Ramsey a kindred spirit in precocity and genius" (101).<sup>34</sup>

---

<sup>29</sup>Diamond (2006-2007) and his curriculum vitae. It was in collaboration with Mirrlees in the summer of 1967 that they extended the model to a diverse population (see also Moscarini and Wright (2007, 549-50)). Mirrlees (M.A. in mathematics from the University of Edinburgh in 1957, and a Ph.D. at Cambridge in 1963) was an assistant lecturer/lecturer at Cambridge from 1963 to 1968, when he became a professor at Oxford. He then returned to Cambridge in 1995 (Blaug (1999, 784)).

<sup>30</sup>Same words are repeated in an interview (Moscarini and Wright (2007, 550)). The paper was also circulated as a working paper (no. 22) of the Department of Economics, MIT, in May of 1968. This version was split and slightly modified to be published as two papers in 1971. In both versions the authors thank Samuelson for comments and cite Ramsey (1927) and Samuelson's 1951 memorandum.

<sup>31</sup>Stiglitz was at this time, the editor of the first two volumes of Samuelson's collected papers.

<sup>32</sup>Stiglitz also received a Tapp Research Fellowship from 1966 to 1970, a period that he spent at Gonville and Caius College, Cambridge.

<sup>33</sup>See Duarte (2009a) for more details on this story and how it was integral part of Ramsey's canonization in economics.

<sup>34</sup>A similar impression that Samuelson enjoyed storytelling comes from Joseph Stiglitz's foreword to Szenberg et al. (2005, ix, italics added): "I loved my MIT courses — but especially I loved my classes with Samuelson. The first half hour (sometimes the first hour, occasionally, the first hour and a half) was often spent on what appeared to be *some*



Lastly, Tony Atkinson spent the academic year of 1966-1967 as a visiting graduate student at MIT, where he seems to have interacted with Samuelson.<sup>35</sup> He obtained his M.A. from Cambridge in 1969 and later, in 1973, was a visiting professor at MIT (Blaug (1999, 43)).

Peter Diamond kindly gave me his perspective on the rediscovery of Ramsey (1927), echoing what he had said in an interview at the time (but that was published only in 2007 (Moscarini and Wright (2007))):

In 1963-65, I twice taught a year-long undergraduate public finance course for economics majors. At the time duality techniques were a hot topic. I worked up the expenditure function approach to measuring deadweight burden for this class. Eventually it appeared in my [*Journal of Public Economics*] paper joint with McFadden. I was on leave in 65-6, mostly in Cambridge, England.

In 1966, I started teaching graduate public finance at MIT. In class, as I presented the deadweight burden measurement, it struck me that it would be interesting to minimize the deadweight burden. Right after class I did that analysis. At the time I was not aware of the existence of Ramsey's paper. At some point I also found the aggregate efficiency result.

I do not have a distinct memory of when I first learned of Ramsey's paper. The logical surmise would be that my colleague, Paul Samuelson would have told me. But it is a logical surmise, not a memory.<sup>36</sup>

Diamond's logical surmise that Samuelson was an important promoter of Ramsey is supported by the evidence I presented here (see also Duarte (2009b)). The existence of a Cambridge connection is not impossible to have existed, but based on the evidence collected I conclude that Samuelson's role was perhaps more important than it in spreading Ramsey's contribution to taxation among public finance economists. Therefore, the right thing to claim is in fact the existence of a Cambridge connection, but Cambridge-U.S. not Cambridge-U.K.

Samuelson was also important in consolidating, among economists in the 1950s and the 1960s, the romantic picture of Ramsey, the young genius who lived long enough to make several groundbreaking contributions to many areas, including economics. This iconic view of Ramsey is illustrated, for example, in the obituary of Robertson that Samuelson wrote in 1963 (or in Samuelson (1970, 1372)). Samuelson (1963, 517) writes that Robertson's precocity reminds him "of the incredible ability of talented youth to master in a season all that the past has established, and then to push the flag forward another furlong. Galois in mathematics, Ramsey in philosophy, and Abba Lerner ..., all belong in this same remarkable category of precociousness."<sup>37</sup>

To conclude, I examined here the context in which Ramsey's 1927 article was rediscovered in public economics in the 1970s thanks to a great extent to Samuelson's writings and classroom lessons. Economists in this field redefined its boundaries in the 1970s towards a general-equilibrium analysis combined with the availability of new data sets and high-speed computers. The effort to frame the discussion on taxation in a second-best framework led to that rediscovery. Ramsey then became a towering figure in this field also because he had been treated as a genius by growth economists in the 1960s, a literature to which several public-finance economists contributed and in which Ramsey had being already canonized.

---

*digression, some comment on the history of the field.* Oblique references might or might not be picked up and developed further later. Then, in the last few minutes of the class, he would turn to the mimeographed notes that he had prepared and bring it all together."

<sup>35</sup>See Atkinson's recollections of his arrival at MIT in Szenberg et al. (2005, 25).

<sup>36</sup>Diamond's account suggests it is unlikely that Little's work with James Mirrlees on cost-benefit analysis at OECD in 1968 was the source of inspiration to Diamond and Mirrlees (1971a,b), as Little has proposed in an interview to Pattanaik and Salles (2005, 365). Moreover, in Moscarini and Wright (2007, 549-50) he added that by the time he "reinvented Ramsey" he was not aware either of Ramsey or "Samuelson's exposition of Ramsey."

<sup>37</sup>Paul Samuelson (1986b, 845) reports that his father's "early death had a profound effect" on him and that "all of the males on both sides of [his] family succumbed early to cardiac conditions." One wonders whether Samuelson's presumption that "anything [he] was to accomplish would have to be done early" made him appreciate the romantic view of Ramsey's life-story.

## 5 Concluding Remarks

My goal in this paper was to understand not only the historical context of the emergence of the optimal taxation literature in the 1970s and the transformation of Frank Ramsey in a giant of this field but also the precise role Paul Samuelson played in this. My narrative emphasizes the increasing dominance of formal general-equilibrium models in the postwar “neoclassicism,” as described by Morgan and Rutherford (1998, 1-26). This emphasis was accompanied by an increasing consensus about the nature of the normative judgments that economists can make, which I characterized as the dominance of the new over the old welfare economics. Both movements are clearly observed in the sub-discipline of public finance: first, there was an emphasis on general-equilibrium, but not formal, analysis by Musgrave (1959), who followed the new welfare economics, and then the next step toward formalization was given by the new generation of economists, who used Musgrave’s book in their graduate studies and who rediscovered Frank Ramsey’s contribution to optimal taxation. Their goal was to generalize Ramsey’s result in an appropriate general-equilibrium and formal framework that had a normative content.

By the time of the rediscovery, Samuelson (1964, [1982] 1986) and Baumol and Bradford (1970) constructed a standard narrative of the developments in the public-finance literature on optimal taxation. Such narrative does not discuss carefully some points that help us understand not only how Samuelson’s unpublished memorandum for the United States Treasury became a central reference in this literature (to the point of being considered, in 1986, “an important historical document” that was then published in the main journal of the field), but also the alleged ignorance of John and Ursula Hicks of Ramsey’s work. The economists who generalized Ramsey (1927) in the 1970s, several of whom were Ph.D. students at the M.I.T. and also went to Cambridge-U.K. They were quick in adopting an account of the developments in that field provided mainly by Paul Samuelson and passed on to his students, in which Ramsey is a giant of public finance who was awakened only forty years after his original contribution.

## References

- Allen, R. G. D. (1938). *Mathematical Analysis for Economists*. London: Macmillan.
- Arrow, K. and E. L. Lehmann (2005). Harold Hotelling 1895-1973, A Biographical Memoir. *Biographical Memoirs* 87, 1–15. National Academy of Sciences, Washington, D.C.
- Auerbach, A. J. and M. Feldstein (1985). Editors’ Introduction. In A. J. Auerbach and M. Feldstein (Eds.), *Handbook of Public Economics*, pp. xv–xvii. Elsevier. Vol. 1.
- Baumol, W. J. and D. F. Bradford (1970). Optimal Departures From Marginal Cost Pricing. *American Economic Review* 60(3), 265–283.
- Baumol, W. J. and S. M. Goldfeld (1968). *Precursors in Mathematical Economics: An Anthology*. London: The London School of Economics and Political Science.
- Bergson, A. (1938). A Reformulation of Certain Aspects of Welfare Economics. *Quarterly Journal of Economics* 52(2), 310–334.
- Bergson, A. (1954). On the Concept of Social Welfare. *Quarterly Journal of Economics* 68(2), 233–252.
- Besomi, D. (Ed.) (2003). *The Collected Interwar Papers and Correspondence of Roy Harrod*. Cheltenham, UK: Edward Elgar. Vol. I: Correspondence, 1919-35.
- Bishop, R. L. (1968). The Effects of Specific and Ad Valorem Taxes. *Quarterly Journal of Economics* 82(2), 198–218.

- Blaug, M. (Ed.) (1999). *Who's Who in Economics*. Cheltenham, U.K.: Edward Elgar. Third Ed.
- Boiteaux, M. (1951). Le "Revenu Distribuable" et les Pertes Economiques. *Econometrica* 19(2), 112–133.
- Davis, J. B. (2005). Robbins, Textbooks, and Extreme Value Neutrality View. *HOPE* 37(2), 191–196.
- De Marchi, N. (2003). Visualizing the Gains from Trade, mid-1870s to 1962. *European Journal of the History of Economic Thought* 10(4), 551–572.
- Diamond, P. A. (2002). Public Finance Theory –Then and Now. *Journal of Public Economics* 86(3), 311–317.
- Diamond, P. A. and J. A. Mirrlees (1971a). Optimal Taxation and Public Production I: Production Efficiency. *American Economic Review* 61(1), 8–27.
- Diamond, P. A. and J. A. Mirrlees (1971b). Optimal Taxation and Public Production II: Tax Rules. *American Economic Review* 61(3), 261–278. Part 1.
- Dixit, A. K. (1970). On the Optimum Structure of Commodity Taxes. *American Economic Review* 60(3), 295–301.
- Duarte, P. G. (2009a). Frank P. Ramsey: A Cambridge Economist. *HOPE* 41(3), 445–470.
- Duarte, P. G. (2009b). The Growing of Ramsey's Growth Model. *HOPE* 41(Supplement), 161–181.
- Feldstein, M. (2002). The Transformation of Public Economics Research: 1970-2000. *Journal of Public Economics* 86(3), 319–326.
- Fraser, L. M. (1933). Taxation and Returns. *Review of Economic Studies* 1(1), 45–59.
- Friedman, M. (1952). The "Welfare" Effects of an Income Tax and an Excise Tax. *Journal of Political Economy* 60(1), 25–33.
- Gaspard, M. (2003). Ramsey's Theory of National Saving: A Mathematician in Cambridge. *Journal of the History of Economic Thought* 25(4), 413–435.
- Goodwin, C. D. W. and R. S. Herren (1975). The Truman Administration: Problems and Policies Unfold. In C. D. W. Goodwin (Ed.), *Exhortation and Controls*. Washington, D.C.: The Brookings Institution.
- Hartley, J. E. (1997). *The Representative Agent in Macroeconomics*. London: Routledge.
- Hicks, J. R. (1939). The Foundations of Welfare Economics. *Economic Journal* 49(196), 696–712.
- Hicks, J. R. (1982). *LSE and the Robbins Circle*. Cambridge, Massachusetts: Harvard University Press. In J. Hicks *Money, Interest and Wages*, Collected Essays on Economic Theory, vol. II, pp. 3-10.
- Hicks, J. R. (1984). *The Formation of an Economist*. New York: Basil Blackwell. In J. Hicks *The Economics of John Hicks*, pp. 281-290.
- Hicks, U. K. (1947). *Public Finance*. London: Nisbet.
- Holden, G. (1940). Incidence of Taxation as an Analytical Concept. *American Economic Review* 30(4), 774–786.
- Hoover, K. D. (2001). *The Methodology of Empirical Macroeconomics*. Cambridge: Cambridge University Press.
- Hotelling, H. (1932). Edgeworth's Taxation Paradox and the Nature of Demand and Supply Functions. *Journal of Political Economy* 40(5), 577–616.

- Hotelling, H. (1938). The General Welfare in Relation to Problems of Taxation and of Railway and Utility Rates. *Econometrica* 6(3), 242–269.
- Keynes, J. M. ([1933] 1972). *The Collected Writings of John Maynard Keynes*. London: Macmillan. Edited by D. Moggridge, vol. X: “Essays in Biography”.
- Kolm, S.-C. (1969). La Verite des Prix dans un Monde Imparfait. *Revue Économique* 20(4), 727–740.
- Lange, O. (1942). The Foundations of Welfare Economics. *Econometrica* 10(3/4), 215–228.
- Lindbeck, A. (1970). Paul Anthony Samuelson’s Contribution to Economics. *The Swedish Journal of Economics* 72(4), 342–354.
- Martina, A. (2000). Could a Basic Result in Optimum Commodity Taxation Theory Have Been Derived Much Earlier than It Was? *HOPE* 32(1), 139–157.
- McKenzie, L. W. (1956). Indirect Taxes in a Leontief System. *Econometrica* 24(2), 210. Abstract, Report of the Ann Arbor Meeting.
- Morgan, M. and M. Rutherford (Eds.) (1998). *From Interwar Pluralism to Postwar Neoclassicism*, Annual supplement to vol. 30 of *History of Political Economy*, Durham. Duke University Press.
- Moscarini, G. and R. Wright (2007). An Interview with Peter Diamond. *Macroeconomic Dynamics* 11(4), 543–565.
- Musgrave, R. A. (1959). *The Theory of Public Finance – a study in public economy*. New York: McGraw-Hill.
- Musgrave, R. A. and C. S. Shoup (1959). *Readings in the Economics of Taxation*. Homewood, Illinois: Richard D. Irwin. Selected by a Committee of the American Economic Association.
- Pattanaik, P. K. and M. Salles (2005). An Interview with I. M. D. Little. *Social Choice and Welfare* 25(2/3), 357–368.
- Pigou, A. C. (1928a). An Analysis of Supply. *Economic Journal* 38(150), 238–257.
- Pigou, A. C. (1928b). *A Study in Public Finance*. London: Macmillan. First edition.
- Pigou, A. C. (1947). Economic Progress in a Stable Environment. *Economica* 14(55), 180–188.
- Ramsey, F. P. (1927). A Contribution to the Theory of Taxation. *Economic Journal* 37(145), 47–61.
- Ramsey, F. P. (1928). A Mathematical Theory of Saving. *Economic Journal* 38(152), 543–559.
- Robbins, L. ([1932] 1935). *An Essay on the Nature and Significance of Economic Science*. London: Macmillan. Second edition.
- Robbins, L. (1938). Interpersonal Comparisons of Utility: A Comment. *Economic Journal* 48(192), 635–641.
- Rozental, A. A. (1957). Selective Excises and the Federal Tax Structure. *Southern Economic Journal* 23(4), 421–433.
- Samuelson, P. A. ([1947] 1983). *Foundations of Economic Analysis*. Cambridge, Massachusetts: Harvard University Press. Enlarged Edition.
- Samuelson, P. A. (1958). Review of ‘Theoretical Welfare Economics’ by J. de V. Graaff. *Economic Journal* 68(271), 539–541.
- Samuelson, P. A. (1960). Harold Hotelling as Mathematical Economist. *The American Statistician* 14(3), 21–25.

- Samuelson, P. A. (1962). The Gains from International Trade Once Again. *Economic Journal* 72(288), 820–829.
- Samuelson, P. A. (1963). D. H. Robertson (1890-1963). *Quarterly Journal of Economics* 77(4), 517–536.
- Samuelson, P. A. (1964). Principles of Efficiency – Discussion. *American Economic Review* 54(3), 93–96.
- Samuelson, P. A. (1969). Pure Theory of Public Expenditure and Taxation. In J. Margolis and G. H. (Eds.), *Public Economics –an analysis of public production and consumption and their relations to the private sectors*, pp. 98–123. London: Macmillan. I.E.A. Conference, Biarritz, 1966.
- Samuelson, P. A. (1970). What Makes for a Beautiful Problem in Science? *Journal of Political Economy* 78(6), 1372–1377.
- Samuelson, P. A. ([1982] 1986a). A Chapter in the History of Ramsey’s Optimal Feasible Taxation and Optimal Public Utility Prices. In K. Crowley (Ed.), *The Collected Scientific Papers of Paul A. Samuelson*. Cambridge: MIT Press. vol. V.
- Samuelson, P. A. (1986b). Seventieth Birthday Remarks, given 18 May 1985, at Wellesley College Club. In K. Crowley (Ed.), *The Collected Scientific Papers of Paul A. Samuelson*, pp. 844–846. Cambridge, Massachusetts: The MIT Press. vol. V.
- Samuelson, P. A. ([1987] 2003b). Out of the Closet: A Program for the Whig History of Economic Science. In M. Blaug (Ed.), *The Historiography of Economics*. Hants: Edward Elgar.
- Samuelson, P. A. (2003a). Edmund Phelps, Insider-Economists’ Insider. In P. Aghion, R. Frydman, J. Stiglitz, and M. Woodford (Eds.), *Knowledge, Information, and Expectations in Modern Macroeconomics: In Honor of Edmund S. Phelps*. Princeton: Princeton University Press.
- Samuelson, P. A. (2006, Sept). Letter to the Author. September 28.
- Sandmo, A. (1976). Optimal Taxation –an introduction to the literature. *Journal of Public Economics* 6(1-2), 37–54.
- Solow, R. M. (1994). Perspectives on Growth Theory. *The Journal of Economic Perspectives* 8(1), 45–54.
- Stern, N. (2002). Toward a dynamic public economics. *Journal of Public Economics* 86(3), 335–339.
- Stiglitz, J. E. (1969). Theory of Innovation – Discussion. *American Economic Review* 59(2), 46–49.
- Stiglitz, J. E. and P. Dasgupta (1971). Differential Taxation, Public Goods, and Economic Efficiency. *Review of Economic Studies* 38(2), 151–174.
- Szenberg, M., A. A. Gottesman, , and L. Ramrattan (Eds.) (2005). *Paul A. Samuelson: On Being an Economist*. New York: Jorge Pinto Books Inc.
- Vickrey, W. S. (1947). *Agenda for Progressive Taxation*. New York: The Ronald Press Company.
- Viner, J. (1968, October 19). Letter to William Baumol. In *William J. Baumol Papers*. Rare Book, Manuscript, and Special Collections Library, Duke University. Box C1, folder “V (1954-1966)”.
- Weintraub, E. R. (1991). *Stabilizing Dynamics: constructing economic knowledge*. Cambridge: Cambridge University Press. Historical Perspectives on Modern Economics Series.
- Weintraub, E. R. (2002). *How Economics Became a Mathematical Science*. Durham: Duke University Press.
- Young, A. A. (1929). Review of ‘A Study in Public Finance’ by A. C. Pigou. *Economic Journal* 39(153), 78–83.