

The Paradoxical Fate of the Representative Firm

by

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Abstract

While modern theorising on the microfoundation of macroeconomics makes intense use of the representative firm notion, severe objections have been raised. Regarded from the history of thought this is the second time that its usefulness is called into question. The paper presents an old literature which has ended with the abandonment of the representative firm from competition theory because it neglects the innovation issue. It shows that its subsequent adoption to macroeconomics suffers from similar flaws. It follows that the representative firm is inappropriate for the analysis of modern competitive economies and should be withdrawn from macroeconomics as well.

Keywords

microfoundation, representative agent, aggregation, innovation, competition, Marshall, Schumpeter

JEL-Classification

B20 (History of Economic Thought since 1925, General)
D00 (Microeconomics, General)
E00 (Macroeconomics, General)

0. Introduction

Since the introduction of the representative firm to economic theory by Alfred Marshall in 1891, more than 100 years have passed. During this long period of time, a lot of arguments have been raised giving either support or opposition to the concept. In recent years the representative firm has found increasing interest from macroeconomists. Since the beginning of the modern microfoundations literature in the early 1970s, the representative firm or its big brother, the representative agent, has been made an essential analytical tool for providing the link between macroeconomics and microeconomics. Within this general debate about microfoundation issues, the microfoundation of business cycle theory has played a prominent role.¹

Current practice, however, is far from being beyond dispute. While real business cycle economists prefer the representativity approach for its formal elegance critics argue that the representative agent is an inappropriate device because it hides economic differences between the agents which should not be discarded from economic theorising.² Varieties among the agents, such as differences of competitive conduct, preferences or revenues, were crucial for understanding macroeconomic phenomena which were just the outcome of interactions between different individuals. Critics go on asserting that handling macrovariables as if they were representations of one single isolated macro-agent lead to fundamentally erroneous results.³ Consequently, the term microfoundation is found to be misleading because it does not build macroeconomics on individual behaviour.⁴ Further, it is concluded that neglect of the co-ordination issue by applying equilibrium theory to macro-problems provides the right answers to the wrong questions.⁵ The representative agent is even found to be a straightjacket which should be torn off.⁶

This is just an exemplary list of recent criticism of the use of the representative agent in macroeconomics and business cycle theory. But looking at the modern microfoundations literature only creates an incomplete picture of the controversial impact of representative reasoning on economic theory construction. From a history-of-thought perspective opposition to the representative agent is nothing new, because there has already been another dispute about the representative firm between the two World Wars. This dispute has not been among macroeconomists, because modern macroeconomics did not yet exist at that time. If the old debate were to be classified according to the modern system

¹ See Ees/Garretsen (1990), Janssen (1991a, 1991b, 1993) for recent critical evaluations of this literature and the references cited therein.

² Hartley (1996), p. 176.

³ Kirman (1992), p. 119. For the so-called Robinson-Crusoe models of the business cycle see e.g. Kydland/Prescott (1982) or Long/Plosser (1983).

⁴ Janssen (1991 a), p. 637.

⁵ Ees/Garretsen (1990), p. 142.

⁶ Williamson (1996), p. 168.

of economic theories it had to be categorised to the microeconomics branch or, more precisely, to competition theory. Its attachment to a different theoretical body might explain why the old literature is not referred to in modern macroeconomic writings despite the fact that it is quite voluminous due to the duration of the controversy which went on for more than 30 years.

It is the virtue of Hartley's recent essay to have called the old critique and the abandonment of the representative agent into memory again.⁷ The goal of the present essay is to extend Hartley's work in two respects. Firstly, it tries to work out the different theoretical orientation of the old controversy of competition theorists which arrived at the dismissal of the representative firm from competition theory more than 40 years before the same claim is raised once again by modern macroeconomists. Secondly, it then switches the perspective and looks upon the representative firm problem from an early macroeconomic point of view in order to find out how and why the second macroeconomic life of the representative firm started shortly after its abandonment from competition theory. The paper is written from a Schumpeterian point of view in order to work out clearly that the double failure of the representative firm is due to its inappropriateness to capture the role of innovations to be an essential device of modern competitive conduct. The Schumpeterian orientation of the present paper provides another contrast and supplement to Hartley's approach who explicitly takes up a neo-classical position.⁸

Section 1 starts by demonstrating Marshall's notion and use of the concept. Particular attention will be given to the built-in equilibrium characteristics of the representative firm. Subsequently, the old representative firm controversy will be outlined in section 2. Its focal point will be to show how Marshallian equilibrium thinking comes under increasing pressure from competition theorists who can demonstrate successfully that essential features of modern market processes cannot be captured by representative reasoning. In Section 3 the adoption of the concept to early macroeconomics will be discussed. The paradoxical fate of the representative firm is made up by its two different lives in two different theoretical bodies. Section 4 presents some concluding thoughts about this and the advantages that might arise from setting up macroeconomic theories without the representative firm.

1. Origin and Use of the Term Representative Firm

The representative firm was first mentioned by Marshall in the second edition of the *Principles of Economics*, which was published in 1891. In the preface to this edition, Marshall indicated that his main interest was focused to 'The Theory of the Equilibrium of Demand and Supply' which he presented in *Book V* of the *Principles*. In this chapter he depicted the famous graphical presentation of the market equilibrium to be the point of intersection of the demand curve and the supply curve in a price-quantity diagram, which has since then become a

⁷ Hartley (1996). For a much more detailed elaboration see Hartley (1997).

⁸ Hartley (1997), p. 4.

standard device of microeconomic theory.⁹ In order to prepare the equilibrium analysis of *Book V*, *Book IV* of the *Principles* was devoted to some introductory considerations. One of them concerned the cost curve which Marshall wanted to analyse by focusing on what he termed to be the normal conditions which were required for the production of a given quantity of a commodity:

*We shall have to analyse carefully the normal cost of producing a commodity, relatively to a given aggregate volume of production; and for this purpose we shall have to study the expenses of a Representative producer for that aggregate volume.*¹⁰

The notion of the Representative producer was then specified by excluding what Marshall thought to be unusual or irregular and by focusing instead on the typical industry-specific characteristics of the manufacturing business:

*On the one hand we shall not want to select some new producer just struggling into business,... nor on the other hand shall we want to take a firm which by exceptionally long-sustained ability and good fortune has got together a vast business ... But our representative firm must be one which has had a fairly long life, and fair success, which is managed with normal ability, and which has normal access to the economies, external and internal, which belong to that aggregate volume of production; account being taken of the class of goods produced, the conditions of marketing them and the economic environment generally.*¹¹

After these preparatory considerations, the equilibrium of supply and demand is then examined in *Book V*. While in market equilibrium the quantities supplied exactly match the quantities demanded and all the commodities are exchanged at the uniform equilibrium price, it is not necessary to assume all firms to be equal. On the contrary, Marshall attached great importance to the fact that he wanted to avoid this assumption.¹² However, the reason for this procedure was stated plainly not until 30 years later in a letter to Professor Flux, in which Marshall criticised Cournot's formal analysis for leading to unrealistic results:

My confidence in Cournot as an economist was shaken when I found that his mathematics ... led inevitably to things which do not exist and have no near relation to reality. One of the chief purposes of my Wander-jahre among factories, etc., was to discover how Cournot's premises were wrong. The chief outcome of my work in this direction, which

⁹ Marshall (1895), p. 425.

¹⁰ Marshall (1895), p. 397.

¹¹ Marshall (1895), p. 397.

¹² Edgeworth (1891), p. 611, who cites from Marshall's introductory remarks to the preface to the 2nd edition of the *Principles*.

occupied me a good deal between 1870 and 1890, is in the Representative Firm theory13

Knowledge of this background reason facilitates both comprehension of Marshall's method as well as interpretation and use of the representative firm. While the label representative conveys the notion of normal or typical, it keeps in mind at the very same time that there is always a population of different firms the analysis of which is merely simplified by focusing on the essential industry-specific characteristics and by neglecting the individual variations. In order to provide an illustration of what happens in market equilibrium, Marshall drew upon the famous biological metaphor of the trees in a forest :

But here we may read a lesson from the young trees of the forest and their struggle upwards through the benumbing shade of their older rivals. Many succumb on the way, and few only survive; those few become stronger every year, they get a larger share of light and air with every increase of their height, and at last in their turn they tower above their neighbours, ... ; but sooner or later age tells on them all ... they gradually lose vitality; and one after another they give place to others, which, though of less material strength, have on their side the vigour of youth .14

By analogy to a full-grown forest which does not change its outward appearance although a lot of growth and decay takes place simultaneously, commodity markets were also characterised by a specific set of equilibrium features around which young firms rise and old ones decline:

And as with the growth of trees, so it is with the growth of businesses. As each kind of tree has its normal life in which it attains its normal height, so the length of life during which a business of any kind is likely to retain full vigour is limited by the laws of nature combined with the circumstances of place and time, and the character and stage of development of the particular trade in which it lies .15

Therefore, the conception of the representative firm has to be regarded as Marshall's attempt to make the analysis of market equilibria more realistic than it was before by including the rise and decline of firms which takes place all the time and which does not stop in equilibrium.

2. The Representative Firm Controversy in the 1920s

Marshall's intention to add realism to equilibrium analysis, however, was in fact merely a conceptual claim which was based only on Marshall's intuitive

¹³ Marshall (1925), pp. 406 - 407.

¹⁴ Marshall (1895), pp. 394 - 395.

¹⁵ Marshall (1895), p. 395.

knowledge he had accumulated from frequent visits to industrial sites.¹⁶ But it was not based on systematic empirical research into the shape of cost curves or revenue curves. In the follow-up literature this deficiency of the conception gave rise to a heated controversy about both the theoretical and empirical features of the representative firm. The controversy can be characterised by two metaphors which were used quite frequently at that time: empty boxes and trees in a forest .

2.1. The Start-up Thesis of the Controversy: Empty Boxes

The controversy was started by Clapham s 1922 essay in which he criticised current practice of contemporary economists to classify industries according to the shape of their revenue curves into increasing-return, constant-return and diminishing-return industries to be theoretical imaginations only which did not have any empirical foundation.¹⁷ Clapham supported his point metaphorically by walking through a hat factory and discussing the different steps of the production process. The boxes stand for three different hat boxes labelled increasing returns , constant returns and diminishing returns into which Clapham figuratively tried to put the raw materials used for hat production according to the characteristics of their return curve or cost curve, respectively.¹⁸ These boxes, however, had to remain empty, because the knowledge required for classification of the industrial inputs did not exist.

Clapham gave a set of different reasons for this, many of which were centered around the innovation issue. Firstly, if products were differentiated, definition of standard commodities were not possible.¹⁹ Secondly, the shape of cost curves depended on the degree of industrial manufacture of the product. For instance, the classification of natural products such as coal seemed to be easy because in every pit the input of resources will yield smaller physical returns of coal as the exploitation of the natural bed approaches depletion. While this might be taken as an argument for putting coal into the diminishing-returns box in the long run, Clapham argued that this were not a relevant phenomenon in economics which were not concerned with geological time. Thought about in more humane time dimensions, the improvement of coal-mining technology may have the contrary effect on the returns curve, because it decreased production costs.²⁰ By drawing attention to Marshall s exclusion of innovations from economic analysis although they might fundamentally alter the shapes of cost

¹⁶ The German term *Wanderjahre* (i.e. journeyman s time of travel) which he used in the letter to Professor Flux cited above refers to his many excursions to manufacturing corporations all over England.

¹⁷ Clapham (1922 a), p. 305.

¹⁸ Clapham (1922 a), p. 306.

¹⁹ Clapham (1922 a), p. 306, p. 311.

²⁰ See Clapham s example of a process innovation in coal mining technology on p. 311, and his considerations about the effects of innovations on costs curves of other inputs required for hat production such as rabbit s fur, shellac, pulp and wool.

curves, Clapham's essay was in fact a plea not to ignore innovations any further.²¹ Clapham also pointed to the necessity of empirical research into the shape of cost curves and revenue curves.²²

In a reply essay Pigou who had been criticised tried to defend his work. But he also supported Clapham's demand for empirical studies and made some suggestions.²³ An important theoretical contribution to the empty-boxes problem was made by Robertson who argued that the course of the cost curves were determined by the amount of factor variation which is possible in the respective production process. In this regard there were a fundamental difference between agricultural production and industrial production. If one factor were fixed, as it were the case for soil in agricultural production, additional units of output could only be yielded at a decreasing rate because the constant factor approached its absolute capacity limit. As this were fundamentally different to industrial production, in which each factor could be increased, the distinction between increasing-cost industries and decreasing-cost industries were equivalent to the distinction between agriculture and industry.²⁴ In addition, industrial costs curves were bound to decline due to economies of scale, innovations of production technology and organisational enhancements. Marshall's representative firm stood for the conditions which established themselves automatically in competitive equilibrium.²⁵ Thus, Robertson used the economies-of-scale argument to reconcile Marshall's equilibrium notion and process innovations.

2.2. The Course of the Debate: Trees in a Forest

The empty-boxes dispute stimulated a discussion among economists about the shapes of cost curves and revenue curves and the appropriateness of the representative firm as a means of analysis which was continued for more than 20 years. While contributions were made to various aspects, the essential theoretical problem was whether the representative firm notion implied a u-shaped cost curve in order to locate the firm's position at the lower turning point. Fixing the position would not be possible on a monotonously declining cost curve, because in this case firms would grow to infinity. Therefore, a lot of discussants

²¹ Clapham (1922 a), p. 314.

²² Clapham (1922 a), p. 312.

²³ Pigou (1922), see also Clapham's (1922 b) rejoinder. For the sake of completeness it has to be mentioned that Pigou tried to promote his conception of the equilibrium firm which however did not gain acceptance in the profession. Therefore, this accessory strand within the representative firm controversy can be excluded from the presentation. For details see Pigou (1928), p. 239; Robbins (1928), p. 387; Schumpeter (1954), p. 997.

²⁴ Robertson (1924), p. 17, p. 27.

²⁵ Robertson (1924), pp. 23 - 24. See also the discussion between Pigou and Robertson following Robertson's essay on pp. 30 - 31.

presented analyses about the characteristics of curve patterns and points of intersection which were required to establish the competitive equilibrium.²⁶

Schumpeter joined into the discussion in 1928 by presenting a couple of different arguments. First, he argued that industries should not be analysed independently from one another, because the rise of input costs in one industry could be caused by rising prices due to rising demand from another industry which were growing and required the same input factors. Second, this type of causal inference had to be distinguished clearly from other types of cost-increasing effects such as the decreasing physical output of a constant factor, mentioned by Robertson above.²⁷ This effect, however, were not limited to agricultural production, but were relevant in industrial production as well. Schumpeter's third and theoretically most important argument went to the static character of the whole consideration. Even the drawing of a diagram such as the cost curve in price-quantity co-ordinates were implicitly based on the assumption that all the other cost-affecting parameters not included in the diagram remained equal. If the data fringe changed due to innovations, the consideration had to be stopped and a completely new diagram had to be drawn which were by principle not comparable to the previous one, even if it looked the same, because it were based on another set of conditions.²⁸ This were particularly relevant for the case of partial factor variation discussed in literature, which were at best valid only in the very short run. Schumpeter concluded that this explained the difficulties of filling the boxes.²⁹

Another argument was brought forward by Young, who said that production costs were dependent on the size of a market which facilitated the use of specialised machinery. If markets started growing competitors were compelled to modernise their production facilities successively in order to keep pace with demand. This in turn stimulated suppliers of raw materials and machinery to improve their offerings which again induced similar effects to their respective input markets. With innovative activities spreading across the whole industrial sector, the inner logic of modern market system unfolded a dynamic change which were driven by innovations and the innovative responses to them.³⁰ The traditional demand-and-supply analysis were not appropriate for modern competitive processes, because it focused on partial aspects only. Modern growth were characterised by a continuous process of *industrial differentiation* which could not be captured by static representative analysis. Marshall's representative firm, once defined at a certain point in time, loosed its identity im-

²⁶ For references see the reading list which Keynes (1930), p. 79, set up in his editorial note on the symposium on the representative firm, and the references cited therein.

²⁷ Schumpeter (1928), p. 366.

²⁸ Schumpeter (1928), pp. 367 - 368.

²⁹ Schumpeter (1928), p. 368.

³⁰ Young (1928), pp. 532 - 533.

mediately afterwards, because the industry which it were apt to represent, were itself not a constant item as well.³¹

In an article frequently cited at that time Robbins explained that the representative firm was not a necessary tool for equilibrium analysis and that it was even superfluous in Marshall's own analysis. First, this conclusion was based on the observation that Marshall made no intensive use of his own conception. This were, second, consistent with equilibrium thinking because all that were required for equilibrium in the presence of heterogeneous factors were that differential rewards corresponded to differential efficiencies. It were therefore simply not necessary to shift to an imaginary average consideration about firms as it were unnecessary to introduce representative pieces of land, machines or workers.³² In addition, and most important in our present context, Robbins found the representative firm even to be misleading, because it *cloaks the essential heterogeneity of productive factors - in particular the heterogeneity of managerial ability - just at that point at which it is most desirable to exhibit it most vividly*.³³ Once again, the innovation issue provided a powerful argument against the applicability of the representative firm. This time it occurred in the shape of the innovative capabilities of corporate leaders to compete on modern industrial markets.

In 1930 Keynes summoned a symposium about the representative firm which in retrospect can be regarded to be the zenith of the controversy.³⁴ The first contribution to the symposium was made by Robertson who argued that the typical features of an industry could not be revealed by analysing the variety of the individual cases. Instead of dealing with exceptional events such as the new entrepreneur just entering into business Robertson sought to focus on the average characteristics of an industry such as the *modal firm* which might be an appropriate approximation of the overall economic conditions of an industry. Concerning Marshall's trees-in-a-forest metaphor one might compare different firms to different sorts of trees such as *oaks ... and hawthorns* which would exist in all stages of their life cycles as well and which, therefore, might also be handled by representative considerations. Thus, the representative firm provided a *fruitful and indeed an indispensable instrument* for economic analysis.³⁵

Sraffa objected to this proposition by arguing that the existence of an industry equilibrium required an u-shaped course of the cost curve in a price-quantity diagram, which, however, did not exist in Robertson's formal considerations. Therefore, it would not be possible to specify the location of the representative firm on Robertson's own grounds.³⁶ Further, the notion conveyed by the trees-in-a-forest metaphor implied a balanced replacement process of new

³¹ Young (1928), pp. 533 - 538.

³² Robbins (1928), pp. 392 - 393.

³³ Robbins (1928), pp. 399 - 402.

³⁴ Robertson/Sraffa/Shove (1930).

³⁵ Robertson (1930), pp. 80 - 84.

³⁶ Sraffa (1930), p. 90.

and old firms having no effects on the properties of the equilibrium. New firms entering into a market, however, were precisely not an identical substitution of old exiting firms, as it were true for trees, because new and old firms necessarily had to have different cost curves. Therefore, the trees metaphor did by principle not conform to economic reality. The representative firm, once having been defined, not only would have to be replaced immediately afterwards, but there would even be no end to this replacement process as long as the cost curve continued to decline. Since the theory of the representative firm could by principle not be made consistent with the facts it set out to explain, Sraffa concluded that Marshall's theory should even be discarded completely.³⁷

Shove's contribution to the symposium was an attempt to intermediate between the two extreme positions. According to Shove, the existence of a competitive equilibrium did not require the individual firms to be in equilibrium as well. In equilibrium, firm level profits might differ due to different abilities of the managements as well as due to other factors such as the different stages of the firms' respective life cycles. The only necessary condition for the existence of a competitive equilibrium was that the firms' size distribution were the most profitable one among all other conceivable distributions so that shifts of output between different firms did not increase total profits of an industry. Given this size distribution, the representative firm could be used as an appropriate tool for a simplified representation of a situation, in which neither economies nor diseconomies of scale could occur.³⁸

If markets increased, however, this condition could not be met, because expansion of output required the instalment of new equipment which did not take place simultaneously and proportionately in all firms. In the general case, growth rates differed between the firms, and therefore equilibrium growth were an extremely unlikely and accidental case. As the representative firm required a very particular set of assumptions which became *less and less common every day* it were not an appropriate tool for the analysis of modern market processes.³⁹ This also applied to the trees-in-a-forest metaphor which were based on the biological life cycle of an anonymous population. But modern industries were not characterised by an anonymous population of transitory firms. Instead, each firm had its own individuality, it followed an idiosyncratic course in time and continued in existence *more or less indefinitely*. Instead of drawing a biological analogy of natural decay, Shove drew an analogy to a *cluster of variable stars, each with its own individuality, magnitude, spectrum and so on, and each with its own characteristic series of light-fluctuations*. In such a situation, Shove concluded, it were *impossible to write the characteristic life-story of a typical or representative firm*.⁴⁰

³⁷ Sraffa (1930), p. 93.

³⁸ Shove (1930), pp. 94 - 96.

³⁹ Shove (1930), pp. 113 - 114.

⁴⁰ Shove (1930), p. 115.

2.3. Preliminary end and definite termination of the controversy

The discussion which was continued for years after the symposium, was interrupted by the outbreak of World War II.⁴¹ Therefore, Mason's contribution marked a preliminary end in 1939. Mason did not use the term 'representative firm' any more, but referred to the expression 'market structure'. This term still took regard of the firm's size distribution, but at the very same time implied an important widening of the perspective. While the previous discussion about the course of cost-curves or revenue-curves had been conducted mainly in Clapham's initial intention to clarify commodity-specific characteristics, now the competitive environment of the market as a whole was taken into consideration. Mason criticised current practice of price analysis which focused on firm-size related factors of price formation only, to arrive at theoretical constructions that were *irrelevant to the real problems*.⁴² Real markets could be distinguished according to their developmental stage and the shifts that occur between the stages. Mason drew an example from automobile industry which had shifted from pure price competition to product competition by making annual changes to the design of their products. Further, as each firm faced a different market situation, it also pursued different competitive practices which included all possible forms of price and non-price competition. Likewise, the price policies of the firms were strikingly divergent over the business cycle.⁴³

All these real world characteristics of competitive conduct had been excluded from traditional static price analysis, which by then had been conducted merely theoretically. The denial of Marshallian theorists to tackle with the dynamics of modern markets is most clearly illustrated by the metaphors they used to illustrate their points. Some of them, such as the biological analogies to the trees in a forest, the oaks and hawthorns or the out-of-earth reference to blinking stars have already been mentioned. Although many of these illustrations were strongly criticised by contemporary discussants for their incomprehensibility and their inappropriateness in an economic setting,⁴⁴ this list was even extended by brown and white furs of wild animals⁴⁵ or the drops of an ocean wave with the bones of a baby being its most curious highlight.⁴⁶

Mason's essay stands out in this respect as well, because it was he who first presented truly economic examples from modern price and product competition among industrial enterprises. In addition to the above-mentioned design competition of car makers he also made references to the market for automobile

⁴¹ For a list of references which extended Keynes' reading list for the symposium see Schumpeter (1954), p. 1046. Schumpeter's list has to be supplemented again by Wolfe (1954), Davies (1955), Hague (1958), and Maxwell (1958), which were published after Schumpeter's death.

⁴² Mason (1939), p. 64.

⁴³ Mason (1939), pp. 70 - 71.

⁴⁴ See e.g. Sraffa (1930), p. 90, p. 93.

⁴⁵ Sraffa (1930), p. 91.

⁴⁶ Robertson (1930), pp. 87 - 88.

body steel, the gross and retail business for car tires, the tire deal of Ford and Firestone, and many more. Therefore, Mason's contribution was a most powerful plea to direct attention to the real world and to start doing empirical research into specific market settings and the full range of competitive actions taken by the enterprises.⁴⁷ Thus, after 17 years of theoretical dispute this line of literature got back to Clapham's initial thesis about the necessity of empirical research. But this time, the call did not fade away unheeded, but gave rise to the new branch of industrial economics. Starting with Bain's famous book after the war, a lot of empirical industry studies now at least examined real-world economic problems.⁴⁸

Marshallian economists, however, had not yet been convinced that the use of the representative firm as an analytical device established theoretical sentences which had no relevance for modern market processes due to its implicit neglect of the innovation issue. After the war, they resumed the debate, mainly by repeating arguments which had been put forward before. For example, see Maxwell's essay, who replied to the critique of neglecting the variety of the agents that it was exactly Marshall's intention to keep variety in mind, because the representative firm stood for the equilibrium conditions around which individual firms always rose and declined.⁴⁹ The innovation argument was also countered by stressing that innovations had been explicitly excluded by Marshall. Given this assumption, equilibrium growth would also be covered by the conception. Therefore, it was even concluded that the representative firm was *necessary to deal with (limited) dynamic change*.⁵⁰ Hague even went one step beyond by trying to complement the representative firm by a Marshallian *competitive firm*.⁵¹ Hague followed this purpose by painstakingly examining Marshall's work, e.g. by comparing different editions of the *Principles*, and by even comparing the wording differences of the footnotes, in order to reveal exactly Marshall's understanding of the competitive process.

The limitations of such a procedure are apparent: It necessarily arrives at unclear or even contradictory passages of the texts or at questions the author had left open either by purpose or unintentionally. More than 60 years after the publication of the second edition of the *Principles*, these issues could not be settled any more. Even more than that: the close adherence to what Marshall really meant blocked the view on modern developments, e.g. such as the emergence of modern forms of non-price competition which did not yet exist when Marshall wrote the *Principles*. Consequently, and not surprisingly, Hague's attempt to construct a Marshallian competitive firm came to the final conclusion that empirical studies were required.⁵² Thus, after 36 years of intense

⁴⁷ Mason (1939), pp. 65 - 66.

⁴⁸ See Bain (1956). Both Bain and Mason are designated to be the fathers of modern industrial economics.

⁴⁹ Maxwell (1958), pp. 693 - 694.

⁵⁰ Maxwell (1958), p. 698.

⁵¹ Hague (1958), p. 673.

⁵² Hague (1958), p. 690.

theoretical debate the representative firm controversy once again returned to the message of Clapham's 1922 seminal article. In 1958, this line of literature was definitely terminated.

3. The Adoption of the Representative Firm in Early Macroeconomics

Spoken in modern terms, the representative firm controversy presented in overview in the previous section would have to be assorted to the micro-economic branch within the science of economics. Today's classification of the subjects into microeconomics and macroeconomics, however, did not yet exist when the controversy took place, because at that time the present division of labour among economists only started to emerge. Although there has been some earlier work on the separation between the two fields, the formal set-up is usually attributed to Keynes who distinguished between the *theory of the individual industry or firm* on the one hand, and the *theory of output and employment as a whole* on the other hand.⁵³ After some tentative applications of the expressions macro-economic and micro-economic by a few pioneering authors they were systematically defined by De Wolff only in 1941.⁵⁴

Having in mind that we are moving around at times when important arrangements of the economic science developed which were most decisive for the shape of nowadays economic theorising, it appears useful to find out how Keynes' juxtaposition of the *individual* and the *whole* was dealt with in the early macroeconomic literature. The problem which those authors had to solve concerned the question under which conditions it was permissible to argue in macroeconomic terms when there was heterogeneity on the micro-level. This is the core of the aggregation problem which played an instrumental role for the emergence of macroeconomics as a separate branch of theory. While this line of literature differed both in its terms and problems from the representative firm controversy, it goes back to a very similar methodological issue: How can the enormous variety of real-world observations be handled analytically in order to establish general theoretical sentences? As we will see the proximity of the issues facilitates adoption of the representative firm to the macroeconomic domain despite the fact that it was not made for this purpose by its inventor.

The initial interest of the early aggregation literature was directed to the derivation of the macroeconomic production function from its microeconomic counterparts. The start-up contribution of the so-called inter-firm-production-function-debate was made by Klein in 1946, who criticised current exercise in business cycle theory of transferring microeconomic equations to the macro-

⁵³ Keynes (1936), p. 293.

⁵⁴ See e.g. Tinbergen (1939), p. 14, who presents the new label *macro-economic* by carefully putting it between quotation marks. For the definitions which were made two years later see De Wolff (1941), p. 140.

economic sphere without making any modifications.⁵⁵ If micro-theory and macro-theory were given by the same equations, a set of very strict assumptions had to be met in order to derive the macroeconomic relation by aggregation of the micro-economic ones.⁵⁶ Pu replied that Klein's arguments were based on the assumption that aggregate output had to be independent from the distribution of the inputs, which were an irrelevant case because real world firms were different. Therefore, Klein's aggregates were *monsters*, which were *completely void of any economic significance*.⁵⁷ Pu then relaxed the tightness of Klein's requirements and allowed for distributions of parameters among different firms and among different types of inputs.⁵⁸

Another point was made by May who argued that the macroeconomic production function was something qualitatively different which could not simply be derived mathematically from the individual firms' production functions because the macroeconomic conditions were also dependent on the socio-economic framework of the whole economy which was more than the simple total of the individual technological possibilities. This argument favoured the independent qualities of macroeconomic relations which were to be derived separately from the microeconomic sphere. Thus, the firms' idiosyncrasies were pushed into the background.⁵⁹

The inter-firm-production-function debate was the spore of a new line of literature in which the aggregation problem and the consequences resulting from the loss of information were examined intensely. An important contribution to this literature was made by Theil who showed that the coefficients of macro-equations were always distorted by an aggregation error, because the coefficients of the underlying micro-equations could not be aggregated by the same procedure which was used for the aggregation of the micro-data. Further, Theil showed that the variance explained by an aggregative model had always to be smaller than the total of the variances explained by the micro-models. In order to avoid these problems Theil derived a formal set of very strict requirements which allowed for *perfect* aggregation, the existence of which, however, could not be recognised because this required knowledge about the micro-parameters in their entirety.⁶⁰ Thus, the aggregative method of economic analysis appeared to be unsatisfying, because it was burdened with fundamental flaws from the outset.

⁵⁵ Klein (1946), p. 93.

⁵⁶ For instance, one criterion is the equality of the marginal productivities of the input factors for both macro- and micro-production function which implies equal wage shares to prevail in all the micro-equations. See Klein (1946), pp. 94 - 107.

⁵⁷ Pu (1946), p. 299.

⁵⁸ For the technical details see Pu (1946), p. 300 - 302.

⁵⁹ May (1947), pp. 62 - 63.

⁶⁰ Theil (1954), chapters 6 and 7.

This line of reasoning was objected by Grunfeld and Griliches, who argued that there were not only losses but also gains from aggregation. This were due to the fact that Theil's results were based on the assumption of perfectly specified micro-equations, which were never possible in reality. If, however, the micro-equations were always misspecified, the individual errors compensated one other during aggregation. There existed a trade-off between Theil's aggregation error and the aggregation gain resulting from the misspecification of the micro-equations. From the omnipresence of unavoidable misspecifications Grunfeld and Griliches concluded that in praxis the aggregation gains dominated the aggregation losses.⁶¹ Therefore, aggregative analysis were a useful means for explaining average behaviour which could be thought of in terms of Marshall's representative firm.⁶²

Based on this conclusion about the advantages of aggregation gains Grunfeld and Griliches picked up the representative firm and put it in the macroeconomic tool-box. While the straightforward arguments of Grunfeld and Griliches directly favoured the aggregative method, at the very same time their message conveyed the implicit implication that micro-analyses of macroeconomic problems could be neglected with good reasons because each micro-analysis would necessarily be affected by the misspecification error and would therefore necessarily succumb to the corresponding aggregative approach. Agents' idiosyncrasies did not matter any more. Thus, Grunfeld's and Griliches' essay provided in fact two-fold support for the superior performance of representative reasoning about macroeconomic problems. The outcome was in fact a reincarnation of the representative firm in a different theoretical body.

4. The Paradoxical Fate of the Representative Firm

Surprisingly, the adoption of the representative firm by the early macroeconomic literature happened only two years after the last contribution to the representative firm controversy. As the evaluation of this line of literature has revealed in section 2 above, the end result of the controversy was the abandonment of the representative firm from competition theory. By finding out that the static nature of Marshall's conception was inappropriate for the analysis of modern market processes, neo-classical price theory had matured to modern competition theory which now explicitly addressed the inherent dynamics of the competitive process, and the role of innovations as a driving force.⁶³

Actually, one would expect that the incorporation of the representative firm into the macroeconomic theoretical body had taken place after a thorough examination of the arguments raised against the conception by competition theorists. A mere examination of this literature, however, even would not have been sufficient, since the reshaping of an analytical tool designed by Marshall to be

⁶¹ Grundfeld / Griliches (1960), pp. 4 - 9.

⁶² Grundfeld / Griliches (1960), p. 10.

⁶³ The standard book reference is Clark (1961), for the German literature see Heuss (1965).

an industry-specific item only - and nothing more - to a genuinely macroeconomic device had required a substantial amount of analytical development and modification. However, such a literature does not exist. Not only is there no reference to the representative firm controversy in Grunfeld's and Griliches' work, there is even no reference to this literature in aggregation theory for the subsequent quarter century. Instead, it appears that the representative firm was transferred to the macroeconomic domain on a purely pragmatic basis only. It found easy acceptance in the literature due to its intuitive properties, which allowed to insill artificial life into analyses of macroeconomic aggregates which otherwise were lifeless theoretical abstractions which could not act on their own.

In addition, as a closer inspection of the mathematical set-up of Grunfeld's and Griliches' technical arguments reveals, validity of their proofs is not as general as it appears to be at first glance. The aggregation-gain argument is based on a set of micro-equations which are assumed to be identical in both their functional forms as well as in the sets of the variables applied.⁶⁴ In such a case aggregation eliminates specification errors, indeed, and does not hide economically relevant idiosyncrasies of the agents, because just they are not included in the formal set-up. Thus, the conclusion that the aggregate equation can be taken to be a simplified representation for the individual equations is built into the mathematical framework from the very outset of the analysis.

The assumption of identical micro-equations, however, does not allow for the sort of variety Schumpeter thought of when he introduced the innovative entrepreneur into economic theory. The first-mover characteristics of the pioneers by which they set themselves apart from their competitors required a completely different mathematical treatment. By setting up identical equations for the micro-agents which differ only in the values of their coefficients, the force which generates phenomena such as growth and cycles which macroeconomic theory sets out to explain are formally excluded from the analysis. Therefore, it has to be kept in mind what Schumpeter had written about the unsuitability of the aggregative method already 21 years before Grunfeld's and Griliches' essay:

It is the disharmonious or one-sided increase and shifts within the aggregative quantity which matter. Aggregative analysis, here, as elsewhere, not only does not tell the whole tale but necessarily obliterates the main (and the only interesting) point of the tale .⁶⁵

He then continued to say that

... in order to produce effects on aggregates, a factor or event need not itself be an aggregate or directly act on an aggregate. It follows on the one hand that, relations between aggregates being entirely inade-

⁶⁴ See Grundfeld's and Griliches' 8-firm example on p.2 and the technical parts of their essay both in the main text, and in the mathematical appendix.

⁶⁵ Schumpeter (1939), p. 134.

*quate to teach us anything about the nature of the processes which shape their variations, aggregative theories of the business cycle must be inadequate, too ...*⁶⁶

Consequently, Schumpeter concluded that the representative firm proved to be *treacherous*, because it covered rather than mended the logical difficulties which occurred when static thinking collided with dynamic economic phenomena.⁶⁷ Later, he even criticised Marshall for this *misplaced realism* in this respect.⁶⁸

Taken in their entirety, the arguments raised by numerous authors against the application of the representative firm as a means for the analysis of modern economic problems were solidly based and forceful in their implications. But as gets plainly evident from their reference lists, aggregation theorists have neither considered Schumpeter's points nor the arguments raised by other competition theorists in the course of the representative firm controversy. Instead, the representative firm was lifted to the macro-sphere without any modification or adaptation to its new field of application. The logical follow-up problems for causal inference can hardly be assessed: If an equilibrium conception which implicitly rests on the perfect co-ordination assumption is made the methodological backbone for macroeconomic analysis which has been confined by the neo-classical synthesis to be theorising about co-ordination failures, inherent contradictions or logical conflicts are beyond control.

By extending the equilibrium approach to macroeconomic theorising, modern microfoundation literature has, in fact, replaced the neo-classical synthesis by a uniform equilibrium approach.⁶⁹ While this has had the unintended side-effect of healing the logical frictions caused by using an equilibrium conception in a co-ordination failure context, this has exactly not rendered the representative firm superfluous. On the contrary, modern new-classical and real-business-cycle approaches persistently argue in representative terms. Only very recently, real business cycle theorists have started pushing forward heterogeneous agent models.⁷⁰ This new development does indeed go into the right direction. However, it yet remains to be seen, how far this branch of theory can move away from its macroeconomic place of birth without losing its genuine characteristics.

Another logical possibility, thereby being quite a different approach, might be to argue solely in Schumpeterian terms. By strictly avoiding to step up to macroeconomic aggregative variables and by arguing instead in variety terms from the very beginning of the analysis, another form of causal reasoning is

⁶⁶ Schumpeter (1939), p. 144.

⁶⁷ Schumpeter (1941), p. 242.

⁶⁸ Schumpeter (1954), p. 1046. Amongst other things, this refers to the fact that Marshall preselected the firms he went to see already by what he thought to be the normal producer.

⁶⁹ Janssen (1991 b), Janssen (1993).

⁷⁰ See the survey of recent work by Rios-Rull (1995).

rendered feasible which does by principle not depend on the representativity assumption. However, this type of theory, which might be called business cycle theory without the representative firm, is the scope of another paper.⁷¹

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⁷¹ Schohl (1997).

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