

History of my economic thinking in dialogue with Schumpeter

By
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In what follows I will discuss my own development in economic thinking, culminating in a reappraisal of David Ricardo's first principle¹², in dialogue with Joseph Schumpeter's reflections on this and other principles of Ricardo, which he brought forward so brilliantly in his book *History of Economic Analysis*³. The beginnings of my economic thinking go back to the fifties of the last century. At the same time Schumpeter completed his *History*.

After describing how I became fascinated by economics up to and including my first acquaintance with Ricardo, I will discuss the development of my economic thinking at university and start the dialogue with Schumpeter, focusing on the assessment of Ricardo's first principle. Subsequently, during the period of my working life, the dialogue will be broadened and placed in the context of Adam Smith's "invisible hand".

My acquaintance with economics

When I was little, we moved to a house with a view: a round bay window on the first floor that looked out onto a wide street with two rows of chestnut trees on either side. Three side streets led into it. Seen from the round window, the wide street seemed to come at you perpendicularly, but below the window the street became narrower and then curved slightly to the right. Opposite our house was a beautifully designed girls' school with on the other side of a small side street next to it,

¹ D. Ricardo, *On the Principles of Political Economy and Taxation*, Volume I of 'The Works and Correspondence of David Ricardo', ed. by P. Sraffa, University Press, Cambridge, 1951 (to be referred to as *Principles*, other references to Ricardo's collected works begin with Volume I to X).

² A. Moons, *A Reappraisal of Ricardo's Principles - On measuring technical change*, published on www.davidricardo-firstprinciple.com (to be referred to as *Reappraisal*).

³ J. Schumpeter, *History of Economic Analysis*, Routledge, London, 1954 (to be referred to as *History*).

where the wide street had become narrower, a primary school and a nursery school, which I visited first.

Growing up I could watch the traffic below me for hours. Behind our house there was a carpet factory that was abandoned around noon or towards evening, the exact time I can't remember, by a large number of workers crossing the wide street on their bicycles. I started to imagine how they experience their work and what they will do after work. But more generally I wondered, in all those hours that I observed all what happened on the street, what prompted all those people to pass by, for example, by bicycle, car or truck. Some go to school, cars full of families go out, but most are probably at work. And I fantasized about the work they would do compared to the work of the factory workers. So, I imagined how everyone earned money and could support themselves. How is it possible that everyone has apparently found a place and that everything (the division of labour, as I would later understand) runs so smoothly?

In the third grade of the boarding school I decided to delve into economics. The first book I read was John Galbraith's *The Great Crash 1929*⁴. With all the exciting events that took place at the stock exchange, this book especially opened my eyes to the fact that things can also go wrong in the division of labour.

I started reading books on economics more systematically when, as a class representative, I had to borrow books from the public library in Haarlem for anyone who wanted to. So I got my hands on all the books on economics there. I also bought three books myself that I still have in my possession: Gardner Ackley's *Macroeconomic Theory*⁵ (this book mainly introduced me to Keynesian ideas and ways of thinking), James Duesenberry's *Business Cycles and Economic Growth*⁶ (now that I look at the book again, it appears to contain a fascinating chapter *Oligopoly and Investment*: reason to come back to that later) and a third that was about modern finance⁷. A fellow boarding schoolmate who saw me reading this book one evening thought it was ridiculous: "his brother had to learn it for his bachelor's exam in economics."

Of the books that I had in my hands at the time in the public library, I cannot remember any book by Ricardo. I was, I think, especially interested in the state of the art of what is so beautifully called 'staathuishoudkunde' in Dutch, or translated simply political or public economics in English.

I first met Ricardo at university, which reminded me of the core: the division of labour and the partnerships such as guilds and firms that shape the division of labour. It was as if I felt him thinking about how societies throughout the centuries have managed not only to enable individuals to accomplish special achievements, such as paintings and other objects of art that cannot be reproduced, but also to jointly create works that have continued to appeal to the imagination over the centuries, such as pyramids, aqueducts and cathedrals. And it is precisely with those achievements in mind that Ricardo and I, following his footsteps, thought it is very important to look at the reproduction processes and see how they have evolved over time. By continuously focusing on

⁴ J. Galbraith, *The Great Crash 1929*, Houghton Mifflin, New York, 1955.

⁵ G. Ackley, *Macroeconomic Theory*, Macmillan, New York, 1961.

⁶ J. Duesenberry, *Business Cycles and Economic Growth*, McGraw-Hill, New York, 1958.

⁷ S. Korteweg en F. Keesing, *Het Moderne Geldwezen*, North Holland, Amsterdam, 1964.

commodities that can be reproduced, it becomes clear how societies could manage to produce a surplus over time that makes those special achievements possible.

Ricardo's felt reflection is very strikingly expressed in his analysis of agriculture. By using less and less fertile land over time, he saw how rent income of landlords continued to rise.

*When land of an inferior quality is taken into cultivation, the exchangeable value of raw produce will rise, because more labour is required to produce it.*⁸

But this means that the price of corn, for example, will also become higher on more fertile soil. This is how rent arises: "for rent is always the difference between the produce obtained by the employment of two equal quantities of capital and labour"⁹. No rent is earned on the least fertile land, but the price of corn, even if it is produced on more fertile land with less labour, is determined on this least fertile land. Thus, the rent income automatically falls to the landlords of the more fertile land. Ricardo notes that not only the landlord will benefit by the advantages resulting from the expenditure of the increased rent:

*If a landlord ... expends his revenue in the manner of an ancient baron, in the support of a great number of retainers, or menial servants, he will give employment to much more labour, than if he expended it on fine clothes, or costly furniture; on carriages, on horses, or in the purchase of any other luxuries.*¹⁰

Ricardo was aware of the fact that rent, this surplus product, could also be used for other purposes. After all, there were similar developments in continental Europe. After the French Revolution, which began with the storming of the Bastille on July 14, 1789, a chaotic period arose with much anxiety among the landlords and the remaining monarchies of continental Europe, which was largely removed by Napoleon, especially through his conquests that ended in the campaign to Moscow. To resist Napoleon, according to Tolstoy's *War and Peace*, one in ten Russian peasants were called into arms, while the mostly noble landowners voluntarily provided the necessary financial resources. In addition to the surplus achieved on more fertile agricultural land, a not insignificant surplus also arose as a result of colonial exploitation, as described, among others, by Multatuli: "A pirate state lies on the sea, between the Scheldt and Eastern Friesland!"

Shortly after the Battle of Waterloo on June 18, 1815, Ricardo began writing his *Principles*, which were published on April 19, 1817. He not only wanted to look back on the development of agriculture, but above all also look ahead. Because, while continental Europe still had to recover from the many battles, the industrial revolution in England was gaining momentum. In his description of that revolution that started around 1760, Arnold Toynbee also points to an agricultural revolution which "plays as large part in the great industrial change of the end of the eighteenth century as does the revolution in manufacturing industries"¹¹. Because agriculture became more and more productive and could supply more and more food, a development could arise in which rapid population growth went hand in hand with a sharply increasing number of non-agricultural workers.

Referring to the great inventions that changed the character of the textile industry, Toynbee states:

⁸ *Principles*, p. 72.

⁹ *ibid.*, p. 71. Or in other words: "Rent is that portion of the produce of the earth, which is paid to the landlord for the use of the original and indestructible powers of the soil.", p. 67.

¹⁰ *ibid.*, p. 393.

¹¹ A. Toynbee, *Lectures on the Industrial Revolution in England*, Beacon Press, 1884, p. 61.

*At first, in fact, machinery raised the wages of spinners and weavers owing to the great prosperity it brought to the trade. In fifteen years the cotton trade trebled itself, from 1788 to 1803 has been called its 'golden age', for, before the power-loom but after the introduction of the mule and other mechanical improvements by which for the first time yarn sufficiently fine for muslin and a variety of other fabrics was spun, the demand became such that "old barns, cart-houses, out-buildings of all descriptions were repaired, windows broke through the old blank walls, and all fitted up for loom-shops, new weavers' cottages with loom-shops arose in every direction, every family bunging home weekly from 40 to 120 shillings per week"*¹².

*At a later date, the condition of the workman was very different. Meanwhile, the iron industry had been equally revolutionised by the invention of smelting by pit-coal brought into use between 1740 and 1750, and by the application in 1788 of the steam engine to blast furnaces. In the eight years which followed this later date, the amount of iron manufactured nearly doubled itself.*¹³

Toynbee then points out that by the end of the eighteenth century "the canal system was being rapidly developed throughout the country". At the same time, inventions continued. "But the most famous invention of all, and the most fatal to domestic industry, the power-loom, ... patented in 1785, did not come into use for several years"¹⁴, and till the power-loom was introduced the workman was hardly injured"¹⁵.

*These improved means ... caused an extraordinary increase in commerce, and to secure a sufficient supply of goods, it became the interest of the merchants to collect weavers around them in great numbers, to get looms together in a workshop, and to give out the warp themselves to the workpeople. To these latter this system meant a change from independence to dependence, at the beginning of the century the report of a committee asserts that the essential difference between the domestic and the factory system is, that in the latter the work is done "by persons who have no property in the goods they manufacture". Another direct consequence of this expansion of trade was the regular recurrence of periods of over-production and of depression, a phenomenon quite unknown under the old system, and due to this new form of production on a large scale for a distant market.*¹⁶

So, the 'golden age' age began to change rapidly in character¹⁷. Domestic production gave way to factories. "The new class of great capitalist employers made enormous fortunes, they took little or no part personally in the work of their factories, their hundreds of workmen were individually unknown to them, and as a consequence, the old relations between masters and men disappeared, and a 'cash nexus' was substituted for the human tie"¹⁸.

Both the 'golden age' and what follows must have had an impact on Ricardo's thinking. This impact is, in my opinion, particularly evident from the persuasiveness that Ricardo wanted to convey in his first principle and the tenacity with which he tried to solve the problem of value, which in fact arises from the question of where and when production will take place more efficiently. I hope to be able to make this plausible in my dialogue with Schumpeter.

¹² Radcliff, quoted in Baines's *History of the Cotton Manufacture* (1835), p. 338-9.

¹³ Toynbee, op. cit., p. 63-4.

¹⁴ In 1813 there were only 2400 in use, in 1820 there were 14,160, and in 1833, over 100,000. See Baines, p. 235-7.

¹⁵ Toynbee, op. cit., p. 63.

¹⁶ *ibid.*, p. 64.

¹⁷ To understand the time in which Ricardo wrote his *Principles*, I would like to quote Toynbee again: "There existed a state of feudal dependence, which, like all feudalism, had its dark and light sides. The close relationship was distinctly the result of the small system of industry, and hence it was shattered by the power-loom and the steam-engine. When, huge factories were established there could no longer be a close tie between the master and his men; the workman hated his employer, and the employer looked on his workmen simply as hands. From 1800 to 1843 their mutual relations, as was admitted by both parties, were as bad as they could be. There could be no union, said employers, between classes whose interests were different, and farmers, contrary to ancient usage, ruthlessly turned off their men when work was slack. The 'cash nexus' had come in, to protest against which Carlyle wrote his *Past and Present*, but Carlyle was wrong in supposing that the old conditions of labour could be re-established", Toynbee, op. cit., p. 121.

¹⁸ *ibid.*, p. 65.

The dialogue with Joseph Schumpeter

Before starting my dialogue, I would first like to consider the reason for this dialogue. The first part of the dialogue covers the continuation of my study in econometrics after my first introduction to Ricardo as described above. At the end of my studies I attributed the development in my thinking mainly to Ricardo, Malthus and Böhm-Bawerk. Ricardo stands head and shoulders above the rest, deeply impressed as I was by his enormous brainpower. Malthus, I especially appreciated him for his correspondence with Ricardo in which he forced him to think even better. I should, however, also mention Smith, although I thought he was above all a journalist, a great observer. But I do owe him a few sentences that, after some reformulation, precisely reflect my concept of absolute value. I read Böhm-Bawerk last: from him I learned how to deal with the factor time and the time preference between consumption versus investments, while reading he helped me by shaping in my mind the concept of how to measure technical change and how investments should be handled in this measurement. Nevertheless, I gave Böhm-Bawerk a small minus at the time: in his *Geschichte und Kritik der Kapitalzins-Theorien*¹⁹ he classifies Ricardo under “Farblose Theorien”.

The second part of my dialogue discusses the period after my studies. That's when I first became acquainted with Schumpeter's *Capitalism, Socialism & Democracy*²⁰. But it was only recently that I started reading his *History* and was pleasantly struck by a number of observations that I would like to share with you and thus prompted me to write this history of thought. Fortunately, Schumpeter's rejection of Ricardo's labour theory of value appears to be far from “farblos”.

To conclude this introduction, I would like to quote from one of the last letters that Ricardo wrote to Malthus.

My complaint against you is that you claim to have given us a accurate measure of value, and I object your claim, not that I have succeeded and you have failed, but that we have both failed – that there is not and cannot be an accurate measure of value.²¹

Below I hope to make it clear that both were close to a solution.

Ricardo's *Principles*, which, as previously indicated, was published in 1817, contains 32 chapters, but only the first chapter *On Value* begins with a clear and powerful statement of the principle elaborated in the main text. I eagerly would like to repeat it here.

The value of a commodity, or the quantity of any other commodity for which it will exchange, depends on the relative quantity of labour which is necessary for its production, and not on the greater or less compensation which is paid for that labour.

This principle precedes the principles that determine income distribution, that is, the distribution of a society's net production. In Ricardo's thinking, the first chapter initially did not require any knowledge of that distribution. In chapter II *On Rent*, Ricardo describes the development in agriculture and the increasing rent income of the landlords as explained above. The other principles

¹⁹ E. von Böhm-Bawerk, *Kapital und Kapitalzins, Erste Abteilung, Geschichte und Kritik der Kapitalzins-Theorien*, Anton Hain, Meisenheim, 1961, p. 76-84.

²⁰ J. Schumpeter, *Capitalism, Socialism & Democracy*, Routledge, London, 1943.

²¹ Volume IX, *Letters 1821-1823*, Letter from Ricardo to Malthus, 15 August 1823, p. 352.

that determine income distribution between landlords, labourers and capitalists follow in the next chapters.

As Schumpeter also notes, Smith's *Wealth of Nations* served as a guideline for Ricardo in writing his *Principles*: "he studied the *Wealth*; he was shocked at what seemed to him to be a logical muddle; he set about straightening out this muddle; and the *Principles* was the ultimate result of this work of creative criticism."²²

The first chapter has a more general character and looks at the division of labour separately from the question of how net production accrues to the participants in the production processes. The strong economic development characterized by the 'golden age', as Toynbee has described, also seems to have been a guideline for Ricardo. The influence of the Industrial Revolution is clearly reflected in the following quotes:

If we suppose the occupations of the society extended, that some provide canoes and tackle necessary for fishing, others the seed and rude machinery first used in agriculture, still the same principle would hold true, that the exchangeable value of the commodities produced would be in proportion to the labour bestowed on their production; not on their immediate production only, but on all those implements or machines required to give effect to the particular labour to which they were applied.

If we look to a state of society in which greater improvements have been made, and in which arts and commerce flourish, we shall still find that commodities vary in value conformably with this principle: in estimating the exchangeable value of stockings, for example, we shall find that their value, comparatively with other things, depends on the total quantity of labour necessary to manufacture them, and bring them to market.²³

And after a detailed description of all the processes that must be completed in the production of stockings, Ricardo continues:

To convince ourselves that this is the real foundation of exchangeable value, let us suppose any improvement to be made in the means of abridging labour in any of the various processes through which the raw cotton must pass, before the manufactured stockings come to the market, to be exchanged for other things; and observe the effects which will follow. If fewer men were required to cultivate the raw cotton, or if fewer sailors were employed in navigating, or shipwrights in constructing the ship, in which it was conveyed to us; if fewer hands were employed in raising the buildings and machinery, or if these, when raised, were rendered more efficient, the stockings would inevitably fall in value, and consequently command less of other things. They would fall, because a less quantity of labour was necessary to their production, and would therefore exchange for a smaller quantity of those things in which no such abridgement of labour had been made.²⁴

It is as if Ricardo, looking around him, sees labour working in production processes of commodities with the help of commodities, including capital commodities, where production becomes more efficient, sometimes here and then there, so that for a commodity that leaves the production processes on balance less direct and indirect labour is required.

The food and clothing consumed by the labourer, the buildings in which he works, the implements with which his labour is assisted, are all of a perishable nature. There is however a vast difference in the time for which these different capitals will endure: a steam-engine will last longer than a ship, a ship than the clothing of the labourer, and the clothing of the labourer longer than the food which he consumes.

According as capital is rapidly perishable, and requires to be frequently reproduced, or is of slow consumption, it is classed under the heads of circulating, or of fixed capital.²⁵

²² *History*, p. 472.

²³ *Principles*, p. 24-5.

²⁴ *ibid.*, p. 25.

²⁵ *ibid.*, p. 31.

All those interlocking production processes took place in his head without caring about who controls or initiates those processes. Ricardo just wanted to know how he could determine where and when which commodity was produced more efficiently and he thought he could deduce this from the exchange values.

“If we had then an invariable standard”²⁶, so Ricardo concludes Section III of *On Value*, then we can deduce from the exchange values where production has actually become more efficient.

Schumpeter assumes that Ricardo wanted to explain the exchange values of commodities as they arise on the market with his theory of value (the text of the first principle also gives rise to this opinion), but in my opinion Ricardo wanted to deduce primarily from those exchange values which commodities are produced more efficiently. That Ricardo was reluctant in his ambition to also explain exchange values is evident from his letter to M^cCulloch in which Ricardo did not distance himself from the principles that determine income distribution.

*After all, the great questions of Rent, Wages, and Profits must be explained by the proportions in which the whole produce is divided between landlords, capitalists, and labourers, and which are not essentially connected with the doctrine of value.*²⁷

In his introduction, Sraffa also quotes this quote and suggests that Ricardo had written it down “in a moment of discouragement with the difficulties of value”²⁸. But I mainly read in that letter a preliminary announcement of the changes that Ricardo would make in the third edition of his *Principles* that appeared a few months later, and which are discussed in detail below in dialogue with Schumpeter.

The answers to the “great questions” concern the principles which determine the income distribution. When describing those principles, Ricardo reflects the reality as Toynbee described it. That is why I do not want to be as brief as Toynbee in his summary of Ricardo's thinking: “In an advancing community, he says, rent must rise, profits fall and wages remain about the same”²⁹. The more complex reality becomes apparent, for example, when Ricardo in chapter II *On Rent* explicitly describes improvements in agriculture by which rent becomes lower³⁰, while these improvements at the same time “would naturally lead to increased accumulation; for the profits on stock would greatly augmented. This accumulation would lead to an increased demand for labour, to higher wages, to an increased population, to a further demand for raw produce, and to an increased cultivation. It is only, however, after the increase in the population, that rent would be as high as before”³¹.

Toynbee's golden age seems to resonate here, as well as in chapter V *On Wages*, where Ricardo repeats this engine for growth.

Although,

²⁶ *ibid.*, p. 29.

²⁷ Volume VIII, *Letters 1819-1821*, Ricardo to M^cCulloch, 13 June 1820, p. 194.

²⁸ Volume I, *Introduction*, p. xxxiii.

²⁹ Toynbee, *op. cit.*, p. 101-2.

³⁰ “If a million of quarters of corn be necessary for the support of a given population, and it be raised on land of the qualities of No. 1, 2, 3; and if an improvement be afterwards discovered by which it can be raised on No. 1 and 2, without employing no. 3, it is evident that the immediate effect must be a fall of rent ... With the same population, and no more, there can be no demand for any additional quantity of corn; the capital and labour employed on No. 3 will be devoted to the production of other commodities desirable to the community”, *Principles*, p. 79.

³¹ *ibid.*, p. 79-80.

The natural price of labour ... depends on the price of the food, necessities, and conveniences required for the support of the labourer and his family.³²

“their market rate may, in an improving society, for an indefinite period, be constantly above it; ... if the increase of capital be gradual and constant, the demand for labour may give a continued stimulus to an increase of people”³³. Ricardo then asks the question: “with every improvement of society, with every increase in its capital, the market wages of labour will rise; but the permanence of their rise will depend on the question, whether the natural price of labour has also risen”³⁴. He states “It varies at different times in the same country, and very materially differs in different countries”. But also: “Many of the conveniences now enjoyed in an English cottage, would have been thought luxuries at an earlier period of our history”³⁵. Towards the end of *On Wages*, Ricardo gives a clear summary.

It appears, then, that the same cause which raises rent, namely, the increasing difficulty of providing an additional quantity of food with the same proportional quantity of labour, will also raise wages; and therefore if money be of an unvarying value, both rent and wages will have a tendency to rise with the progress of wealth and population. But there is this essential difference between the rise of rent and the rise of wages. The rise in the money value of rent is accompanied by an increased share of the produce; not only is the landlord’s money rent greater, but his corn rent also; ... (it) will exchange for a greater quantity of all other goods which have not been raised in value. The fate of the labourer will be less happy; ... his general condition will be deteriorated, by his finding it more difficult to maintain the market rate of wages above their natural rate.³⁶

In addition to the last quote, Chapter VI *On Profits* shows that when the least fertile land is taken into use in response to wage increases, the rate of profit falls on the higher capital required to pay the higher wages. Due to the higher rent and higher wages on the more fertile land, the rate of profit also falls there to the same extent. The rise in wages also increases the capital required in industry to provide workers with a livelihood, and the rate of profit falls there too. But, Ricardo concludes:

*The natural tendency of profits then is to fall; for, in the progress of society and wealth, the additional quantity of food required is obtained by the sacrifice of more and more labour. This tendency, this gravitation as it were of profits, is happily checked at repeated intervals by the improvements in machinery, connected with the production of necessities, as well as by discoveries in the science of agriculture which enable us to relinquish a portion of labour before required, and therefore to lower the price of the prime necessary of the labourer.*³⁷

Moreover, it seems that the large increase in the number of power-looms put into use since 1813 (see footnote 13) and the enormous profits that have been achieved have also been reflected in Ricardo's comment that with high demand for a commodity the market price may be high. “This, however, is but a temporary effect. The high profits on capital employed in producing that commodity, will naturally attract capital to that trade; and as soon as the requisite funds are supplied, and the quantity of the commodity is duly increased, its price will fall, and the profits of the trade will conform to the general level”³⁸.

Nevertheless, the turnaround in the development of the textile industry as described by Toynbee also seems to have given Ricardo sufficient reason to extensively point out possible adverse effects of a (too) strong expansion of machinery in Chapter XXXI *On Machinery*, added to the third edition of

³² *ibid.*, p. 93.

³³ *ibid.*, p. 94-5.

³⁴ *ibid.*, p. 96.

³⁵ *ibid.*, p. 97. Ricardo continues: “From manufactured commodities always falling, and raw produce always rising, with the progress of society” such a change in the composition of wages is easy to understand.

³⁶ *ibid.*, p. 102.

³⁷ *ibid.*, p. 120.

³⁸ *ibid.*, p. 119.

Principles. Such production of machinery may indeed withdraw so much capital and labour from other sectors that it is at the expense of the reproduction of the “quantity of food, necessities, and conveniences required for (continuing) the support of the labourer and his family”. If we only consider how contemporaries reacted to this new chapter, in which there is quite a bit of disappointment, this can quickly obscure a clear view of the reality as Toynbee so convincingly sketched and that Ricardo apparently shares.

Before we return to the relationship between exchange values as determined by embodied labour on one side and prices as established on the market on the other, it should be mentioned that, according to Ricardo, rent can also arise from the use of machines: when “newly constructed machinery be less efficient than the old”. For example, because the old machines benefit from a fast-flowing river, while the new ones only have access to slower-flowing water: then “a rent would be paid to all those who possessed the most productive machinery”³⁹.

We have already seen that the explanation of the “great questions” can mainly be traced back to Ricardo's principle about price formation. A principle that is immediately expressed in Chapter II *On Rent*.

*The exchangeable value of all commodities, whether they may be manufactured, or the produce of the mines, or the produce of land, is always regulated, not by the less quantity of labour that will suffice for their production under circumstances highly favourable, and exclusively enjoyed by those who have peculiar facilities of production; but by the greater quantity of labour necessarily bestowed on their production by those who have no such facilities; by those who continue to produce them under the most unfavourable circumstances.*⁴⁰

It is important, however, that in contrast to the least favourable production conditions in the above quote, he also points out in advance that this is not about the exchange value of commodities as a result of “the less quantity of labour that will suffice for their production under circumstances highly favourable”: thus resulting from more fertile land or richer raw material mines, while it can also be the result of more efficient industrial production. To which he also adds that those advantages “exclusively (be) enjoyed by those who have peculiar facilities of production”. These can therefore be rent advantages, but they can also be advantages that accrue to the owners of industrial firms that produce more efficiently than their competitors.

I am unravelling this quote to draw your attention to a contrast between the prices that arise on the market for industrial production under the least favourable conditions and the prices that could be achieved if the “peculiar facilities of production” were to become generally valid, that is, if they were to become available to all firms. In that case, the most favourable circumstances coincide with the least favourable and the determination of prices on the basis of the least favourable circumstances remains intact. Yet it is important to see the tension between prices according to the least favourable conditions and the conceivable prices that reflect the most favourable conditions. This tension will be discussed frequently below.

For now it is important that Schumpeter also addresses the “great questions” of the income distribution between the three agents, landlord, labourer and capitalist. He does foresee problems:

³⁹ *ibid.*, p. 75-6.

⁴⁰ *ibid.*, p. 73.

“If one accepts a labor-quantity theory of value, ..., the three-factor schema, which we have been commending for its simplicity, meets with *analytic* difficulties For the distributive shares must be paid from prices of products that, owing to the presence of claimants other than labor, cannot in general be proportional to the quantities of labor embodied in those products”⁴¹. Under the assumption that the most favourable and least favourable production conditions coincide as a result of perfect competition, so that price formation in accordance with the least favourable conditions remains intact, Schumpeter's hesitation with the labour-quantity theory of value seems unfounded.

This does not alter the fact that I would like to point out how Schumpeter gets to the heart of “the central theorem of the Ricardian theory of value: in conditions of perfect competition (which Ricardo failed to specify)⁴² the exchange values of commodities will be *proportional* to the quantities of labor contained or embodied in them”⁴³.

He also rightly mentions that this outcome of perfect competition, according to Ricardo, may only be achieved over time. Ricardo made this clear “by saying that his labor-quantity law applies to natural prices, that is, to the relative prices that will ultimately prevail when fluctuations due to temporary disturbances shall in each case have subsided”⁴⁴. Furthermore, Schumpeter admits that the “theorem would be true (for perfect equilibrium in perfect competition) if labor ... were the only requisite of production”⁴⁵. However, based on the last quote from Ricardo (see footnote 38), he incorrectly points out the “fundamental difficulty that arises from the existence of scarce natural factors”. After all, labour is not the only, but only a necessary production factor that does not exclude other production factors.

But the real objections, leading to “acknowledgment of failure of the labor-quantity principle”⁴⁶ were attached to Sections IV and V of chapter *On Value*. In it, Ricardo shows that the exchange values of commodities that differ in the way in which capital is used respond differently to changes in income distribution, with one commodity becoming relatively cheaper and the other more expensive. This seems to be in direct contradiction to the principle that wages have no influence on exchange values.

Ricardo himself indicates this as appears from the headline of Section IV:

*The principle that the quantity of labour bestowed on the production of commodities regulates their relative value, considerably modified by the employment of machinery and other fixed and durable capital.*⁴⁷

In this section Ricardo assumes two men who each employ a hundred men. One uses his men in the first year to build a machine, the other employs his men in cultivating corn. The machine “at the end of the year will be of the same value as the corn, for they will each be produced by the same quantity of labour”⁴⁸. The next year the owner of the machine uses this, with the assistance of one hundred men, in making cloth, while the farmer continues to employ one hundred men as before in the cultivating of corn.

⁴¹ *History*, p. 559.

⁴² This correct observation between brackets pleased me very much as you will see soon.

⁴³ *ibid.*, p. 592.

⁴⁴ *ibid.*, p. 592-3.

⁴⁵ *ibid.*, p. 593.

⁴⁶ *ibid.*, p. 594.

⁴⁷ *Principles*, p. 30.

⁴⁸ *ibid.*, p. 33.

With a wage per workman of 50 pounds per year and a profit rate of 10 percent, the value of the machine as well as of the corn, at the end of the first year, would be 5,500 pounds. The second year the manufacturer and the farmer will again employ 5000 pounds each in the support of labour. The farmer will again sell his corn for 5,500 pounds. But the manufacturer must obtain a further sum of 550 pounds; for the profit on 5,500 pounds which he has invested in machinery, and consequently his goods must sell for 6,050 pounds.

And then Ricardo asks how will their relative value be affected by a rise in the value of labour? Because there can be no rise in the value of labour without a fall of profits, Ricardo supposes a fall from 10 to 9 per cent by which the profit on the fixed capital of the manufacturer will equal to 495 pounds, consequently the price of the cloth would be 5,995 pounds instead of 6,050 pounds. Ricardo concludes:

As the corn would continue to sell for 5,500 pond, the manufactured goods in which more fixed capital was employed, would fall relatively to corn or to any other goods in which a less portion of fixed capital entered. The degree of alteration in the relative value of goods, on account of a rise or fall of labour, would depend on the proportion which the fixed bore to the whole capital employed. (In case of a rise:) All commodities which are produced by very valuable machinery, or in very valuable buildings, or which require a great length of time before they can be brought to market, would fall in relative value, while all those which were chiefly produced by labour, or which would be speedily brought to market would rise in relative value. The reader, however, should remark, that this cause of the variation of commodities is comparatively slight in its effects.⁴⁹

Slight in its effects in comparison “with the other great cause of the variation in the value of commodities, namely, the increase or diminution in the quantity of labour necessary to produce them”⁵⁰.

Section V also starts with a telling headline:

The principle that value does not vary with the rise or fall of wages, modified also by the unequal durability of capital, and by the unequal rapidity with which it is returned to its employer.⁵¹

In the previous section it was assumed that the machine does not deteriorate in efficiency during use. In this section Ricardo writes:

If fixed capital be not of a durable nature, it will require a great quantity of labour annually to keep it in its original state of efficiency; but the labour so bestowed may be considered as really expended on the commodity manufactured, which must bear a value in proportion to such labour.⁵²

In other words, Ricardo takes into account replacement investments in the form of direct labour. This leads to the following conclusion:

It appears, too, that in proportion to the durability of capital employed in any kind of production, the relative prices of those commodities on which such durable capital is employed, will vary inversely as wages; they will fall as wages rise, and rise as wages fall; and, on the contrary, those which are produced chiefly by labour with less fixed capital, or with fixed capital of a less durable character than the medium in which price is estimated, will rise as wages rise, and fall as wages fall.⁵³

⁴⁹ *ibid.*, p. 35-6.

⁵⁰ *ibid.*, p. 36.

⁵¹ *ibid.*, p. 38.

⁵² *ibid.*, p. 39.

⁵³ *ibid.*, p. 43.

Section VI with headline *On an invariable measure of value* starts with the desirability of having a commodity that can serve as an invariable standard measure of value. Ricardo concludes:

Of such a commodity it is impossible to be possessed, because there is no commodity which is not itself exposed to the same variations as the things, the value of which is to be ascertained; that is, there is none which is not subject to require more or less labour for its production. But if this cause of variation in the value of a medium could be removed – if it were possible that in the production of our money for instance, the same quantity of labour should at all times be required, still it would not be a perfect standard or invariable measure of value, because, as I have already endeavoured to explain, it would be subject to relative variations from a rise or fall of wages, on account of the different proportions of fixed capital which may be necessary to produce it, and to produce those other commodities whose alteration of value we wish to ascertain.⁵⁴

I personally cannot but agree with this conclusion.

“So the murder is out”⁵⁵, writes Schumpeter after his discussion of sections IV and V, drawing mainly on words from Ricardo himself. But lo and behold, it seems as if Schumpeter is blaming the murder on others, to allow for the possibility of him remaining even on Ricardo's side. In any case, this is where Schumpeter's admiration for Ricardo's enormous brainpower culminates.

To be sure, Ricardo tried to minimize the damage to his fundamental construction by pointing out that the quantity of labor still remains the most important determinant of relative value, which is why above we have described his theorem as an approximation. This seems to do more justice to his thought than does the interpretation that appeals to other historians: these, following a lead of Marshall's, prefer to say that Ricardo had 'really' a cost theory of value. It is true that in effect Ricardo ended up by co-ordinating the element of accrued profits with the element of quantity of labor. It is also true that sometimes (see ch. 30, first sentence) he did make Cost of Production (evidently including the former element) the 'ultimate regulator' of values. But if this were all, his exposition would reduce simply to a roundabout way of stating a view that was current in his time: it would be difficult to see what it was he fought for with so much insistence and what the ensuing controversies were about.⁵⁶

And Schumpeter goes further with reference to an earlier interpretation⁵⁷:

And our interpretation – the interpretation that is characterized by the word approximation – seems to me the most obvious one in the case of a writer who was quite free from either emotionalism or philosophical preconceptions.⁵⁸

I myself fully agree with the changes that Ricardo has made to his *Principles*, and also agree with Schumpeter's approximation. Exchange values are always influenced by income distribution. But this does not detract from the correctness of the principle underlying the chapter *On Value*. The changes only show that the search for a commodity that could serve as an invariable measure of value was doomed to failure. The concept of value, of absolute value, must be defined differently. But before I do that, I would like to refer to what Ricardo wrote just before his death.

I may be asked what I mean by the word value, and by what criterion I would judge whether a commodity had or had not changed its value. I answer, I know no other criterion of a thing being dear or cheap but the sacrifices of labour made to obtain it. ... That the greater or less quantity of labour worked up in commodities can be the only

⁵⁴ *ibid.*, p.43–4.

⁵⁵ *History*, p. 594.

⁵⁶ *ibid.*, p. 594.

⁵⁷ *ibid.*, p. 593. There Schumpeter describes sections II to VII of the first chapter which are “devoted to an attempt to show that his labor-quantity law of equilibrium values, though not generally true, yet constitutes an acceptable approximation throughout the range of perfect competition”.

⁵⁸ *ibid.*, p. 595.

cause of their alteration in value is completely made out as soon as we are agreed that all commodities are the produce of labour and would have no value but for the labour expended upon them.⁵⁹

This quote speaks for itself. It shows Ricardo's unshaken confidence in the correctness of his first principle. I can only agree and reiterate that commodities are produced efficiently when this is done with as little direct and indirect labour as possible. And also that labour is the only indispensable production factor (which does not rule out that there are other production factors such as solar, wind and hydropower, as well as land that differs in fertility), and that efficient production is in no way influenced by income distribution, but only depends on the technical production circumstances. But how can we determine efficient production? Can this be derived from the exchange values as they arise on the market?

If Ricardo is right, I thought, then we should not only look at the exchange values but especially at the result per worker that is achieved in the production of commodities, i.e. the result before it is divided into wages and profits. A firm that manages to produce a commodity more efficiently than its competitors will then (because the price is determined by production under the least favourable conditions) achieve a relatively high result per worker. From the development of the result per worker in relation to the production volume and the exchange values of commodities, it should be possible to deduce where and when which commodities are produced more efficiently. And, then, it only concerns exchange values actually established on the market, without the requirement that the market be in equilibrium. I was convinced that it should be possible to deduce from the actual unbalanced prices, year after year, where and when production would become more efficient.

When a firm starts producing more efficiently, we will see a tension arise. After all, you cannot expect its competitors to immediately follow suit. A tension arise between production under the least favourable circumstances that determine the market price and the newly created more favourable conditions. In my view, Ricardo's first principle focuses mainly on the emergence of more efficient production, that is, production produced with less direct and indirect labour than before, without this being in any way dependent on income distribution.

Ricardo's choice to look for a commodity that could serve as an invariable measure of value broke him up in the chapter *On Value* because the exchange values all commodities are influenced by changes in the income distribution. We will see how *On Value* becomes completely independent again of income distribution, by defining the concept of value differently.

An intermediate step

As a student, I came into contact with Gerard Debreu's *Theory of Value*⁶⁰ during mathematical economics lectures. This beautiful, clearly formulated book left me deeply impressed by the description of households that purchase consumer commodities in exchange for their labour. But with Sraffa's *Production of Commodities by Means of Commodities*⁶¹ in the back of my mind I thought of Debreu's description of the production sector: it can and must be improved.

⁵⁹ Volume IV, *Absolute Value and Exchangeable Value*, sheet written on a letter-cover postmarked 18 August 1823, p. 397.

⁶⁰ G. Debreu, *Theory of Value – An Axiomatic Analysis of Economic Equilibrium*, John Wiley & Sons, New York, 1959.

⁶¹ P. Sraffa, *Production of Commodities by Means of Commodities, Prelude to a Critique of Economic Theory*, University Press, Cambridge, 1972.

Nikaido's *Convex Structures and Economic Theory*⁶² showed the way. Nikaido describes the technical production options for each sector of a Leontief input-output system, with labour as an indispensable production factor in each production process. There may be numerous mutual deliveries between the sectors, broken down into firms if desired. The total of production possibilities is limited to the set that shows net positive production. After all, production without leading to consumption makes no sense. Within this collection it can then be determined which options are the most efficient. And, so far, everything is independent of wages and prices, therefore independent of income distribution.

Given the set of productive technical production possibilities, *Draft of Equilibrium*⁶³ determines the set of prices that generate a positive outcome per worker. As well as the set of prices with a corresponding demand for commodities from households.

Now we have only to establish under what conditions competition can lead to an equilibrium between supply and demand. As we have seen, Ricardo, as Schumpeter rightly pointed out, did not specify these. In *Draft of Equilibrium* I preferred a fictional competition mechanism. I used the rule that firms compete with each other and take over labour from other firms as long as their result per worker is higher. An equilibrium then results as soon as the result per worker is the same everywhere, while price formation ensures that at the same time, precisely those commodities are efficiently produced that are demanded by households at those prices.

At the time I did not realize that the relative prices that arise under this competition on the market in the equilibrium situation are exactly a reflection of the direct and indirect labour required in production. The fact that I did not realize this conclusion at the time is because I was more concerned with questions of how to deal with investment in machinery. The production structure used in *Draft of Equilibrium* is rather simple: only intermediate commodities consumed in successive periods are taken into account, but not machines which contribute to production period after period. Of course, like other commodities, these machines should be produced with as little direct and indirect labour as possible. But it becomes more complicated to determine to what extent the use of durable machinery in the production of other commodities leads to an overall greater efficiency.

Coincidentally, I came into possession of a book by Böhm-Bawerk at the time and was immediately captivated by his following proposition: "Daß das Einslagen von Produktionsumwegen zu größeren Produktionserfolgen führt, ist einer der wichtigsten und grundlegendsten Sätze der gesamten Produktionstheorie." He explains this as follows: "wo man ein Gebrauchsgut sowohl auf direktem als auf indirektem Wege hervorbringen kann, offenbart er sich darin, daß man auf dem indirekten Wege mit gleich viel Arbeit mehr Produkt oder das gleiche Product mit weniger Arbeit erlangen kann"⁶⁴. While the advantages are clear, according to Böhm-Bawerk, these roundabout production methods also have disadvantages: it takes time. As capital commodities used are more durable, it takes more time before the consumer commodities can be brought to the market.

⁶² H. Nikaido, *Convex Structures and Economic Theory*, Academic Press, New York, 1968.

⁶³ A. Moons, *Draft of Equilibrium*, published on www.davidricardo-firstprinciple.com.

⁶⁴ E. von Böhm-Bawerk, *Kapital und Kapitalzins, Zweite Abteilung, Positive Theorie des Kapitaless, Erster Band*, Fisher, Jena, 1921, p. 13.

I was also struck by the almost Ricardian precision with which Böhm-Bawerk describes capital formation. He calls it “Ein Ersparen von Produktivkräften. Man spart an Genußmitteln, erspart dadurch Productivkräfte und kann mit diesen endlich Kapitalgüter produzieren”⁶⁵.

After indicating how Crusoe can best divide his time between the immediate acquisition of consumer commodities and the maintenance of his necessary capital commodities, Böhm-Bawerk leaves his lonely shore to direct his analysis to a society consisting of millions of labourers and a quantity of capital accumulated in the past. Given the size of the subsistence fund, Böhm-Bawerk shows at what length of the production period both the highest wage and the highest profit result. He trusts that market forces will ensure that this result will be largely achieved, for if not, either a portion of the available subsistence fund or a portion of the available labour will remain unused.

The subsistence fund actually includes the total of commodities available for consumption, as Böhm-Bawerk himself says: “Wir dürfen also als fix annehmen, daß das ganze Angebot an Arbeit und das ganze Angebot an Gegenwartsgütern gegeneinander zum Umsatz kommen”⁶⁶.

This brings me back to the productive forces that may produce either consumption or capital commodities. While reading Böhm-Bawerk and his tables showing the optimal length of the production period, it was obvious for me that machinery produced with as little labour as possible must also have an optimal lifetime which is independent of the income distribution, so that efficient production is always characterized over time by using as little labour as possible. But at that time I was mainly concerned with the question of how the optimal lifetime can be determined. Where many firms use the same machines, measuring the technical change will quickly reveal which firm has the optimal lifetime for its machines and therefore produces most efficiently. But often the situation is more complex. In any case it was clear to me that I had to limit myself to observable facts, such as the moment at which new investments are put into use. When measuring technical change I cannot rely on assumptions, such as regarding the expected lifetime or possible labour savings.

I came to the conclusion that within the two-sided valuation method as proposed in *Reappraisal*, another two-sided valuation method had to be discerned when it comes to investments, that is, meaningful investments, because regular investments such as replacing trucks can be considered as intermediate inputs. One side of this method considers a meaningful investment, such as a new factory for an existing commodity, as an intermediate input that requires a relatively large amount of labour, making it clear that the initial costs may outweigh the presumed later benefits. The other side ignores this investment as if it is part of consumption. This side makes clear to what extent the investment directly makes it possible to produce commodities with less direct and indirect labour than before. Only by following the facts regarding meaningful investments over a series of years can we determine whether these investments have yielded what was expected and to what extent the initial costs actually contributed to saving labour or to increasing total consumption.

Another question that bothered me was whether a society wants to give up consumption now in order to make investments that will yield more consumption in the future. But here I will confine myself to another reference by Schumpeter to Ricardo’s concept of circulating, or of fixed capital between “which the line of demarcation cannot be accurately drawn”⁶⁷. Schumpeter points out “the

⁶⁵ *ibid.*, p. 139.

⁶⁶ *ibid.*, p. 449.

⁶⁷ *Principles*, footnote, p. 31.

analogy that exists between different durabilities of the fixed capital used in different lines of production and the different rates of turnover of different kinds of circulating capital". Even though these facts have, at first sight, nothing in common, Schumpeter notes:

Now, by what almost amounted to flash of genius, he saw that all three of them did so for the same reason or, to put it differently, he saw the same fundamental element in all of them, namely, the time distance between investment and the emergence of the corresponding consumers' good.⁶⁸

And in extension of "Ricardo's rudimentary capital analysis" Schumpeter states "Ricardo was clearly Böhm-Bawerk's forerunner so far as this set of problems is concerned"⁶⁹.

Other questions that perhaps concerned me even more are related to reality, which shows a different competition than the fictional competition that is supposed to take place in *Draft of Equilibrium*. From the actual exchange values as they arise under actual competition and using the actual result per worker, we can indeed deduce where and when which commodity is produced more efficiently. For that search that is virtually identical to the one Ricardo had in mind, a more precise definition of what Ricardo called absolute value is indispensable.

Production per labourer remains invariable in value from year to year

I already knew that the solution to the problem of value had to be sought in the total of the commodities produced. As an student in econometrics, I was entitled to a special book allowance every year. At some point I bought Ricardo's collected works and after reading everything he wrote about the problem of value, I knew the solution. When discussing the chapter *On Value*, Schumpeter again states, and I would like to agree with him, that "Ricardo, starting his theoretical work by a study of the *Wealth of Nations*, was displeased with what he rightly felt to be a logical muddle."⁷⁰ This does not alter the fact that I was in the habit of reading the *Wealth of Nations* myself to see if I could agree with all of Ricardo's criticism of Smith. This also applies to his criticism that it cannot "be correct, to say with Adam Smith, 'that as labour may sometimes *purchase* a greater, and sometimes a smaller quantity of goods, it is their value which varies, not that of the labour which purchases them;' and therefore, 'that labour *alone never varying in its own value*, is alone the ultimate and real standard by which the value of all commodities can at all times and places be estimated and compared'."⁷¹

When I looked up these quotes in the *Wealth of Nations* I read from a few lines earlier (the underlined words were inserted by myself):

The product of "equal quantities of labour, at all times and places, may be said to be of equal value". The value of this product "must always be the same, whatever may be the quantity of goods". This product, indeed, may sometime consists of "a greater and sometimes a smaller quantity; but it is their value, the value of the separate commodities, which varies, not that of the total product of labour." The product of "labour alone, therefore, never varying in its own value, is alone the ultimate and real standard by which the value of all commodities can at all times and places be estimated and compared"⁷².

⁶⁸ *History*, p. 636.

⁶⁹ *ibid.*, p. 637.

⁷⁰ *ibid.*, p. 590.

⁷¹ *Principles*, p. 16-17.

⁷² A. Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations*, Book 1, Chapter V, p. 47, edited by E. Cannan, Bantam Books, New York, 2003.

That's it, that's how I can express my ideas: the product of labour, of equal quantities of labour, is invariable in value at all times and places in equal periods⁷³.

The *Note to "On Absolute Value and the Value in Exchange of Commodities"*⁷⁴ describes the state of my thinking at the time of my graduation. In addition to the result per worker, you may also look at the total result per worker and the average result. You may soon start to play with the different ways in which you can look at their mutual coherence. And partly by breaking down the total result into the exchange values times the net commodities produced, the two-sided valuation was created.

At some point I saw the method fully operational in my thinking, including the way in which investments should be handled. But at the same time I did not yet consider myself capable of working out the method mathematically for all sectors supplying each other. I only managed that for a simple economy (see section 2 of *Reappraisal*).

In the public presentation of the *Note to "On Absolute Value and the Value in Exchange of Commodities"* which explains the method of two-sided valuation, I had to defend myself against the suspicion that I was merely piling up tautologies, so I was pleasantly surprised by the way in which Schumpeter analysed Ricardo's thinking.

According to Schumpeter, Ricardo did not strive for one "comprehensive vision of universal interdependence of all the elements of the economic system" but he focused on a "clear-cut result of direct, practical significance". Schumpeter describes his approach as follows:

*He then piled one simplifying assumption upon another until, having really settled everything by these assumptions, he was left with only a few aggregative variables between which, given these assumption, he set up simple one-way relations so that, in the end, the desired results emerged almost as tautologies.*⁷⁵

This clearly applies to his rent theory and, for example, also to his determination of the rate of profit. However, it also applies to the two-sided valuation with the stacked tautologies that come to life because they have to obey the law that the product of equal quantities of interconnected labour is invariable over time⁷⁶.

To get the right result I had to go through trial and error in determining the final form of the two-sided valuation. I only recently took on that task, after the disappearance of our daughter Danaë following a boat accident on one of the rapids of the Mahakam in Borneo in 2015. Her drive in working on sculptures and drawings, with perseverance and an almost inexhaustible work force, focused on research into man and nature, and in particular into the destructive forces of nature which she also saw present in man and which are so compellingly depicted by Goya's *Disasters of War*. With her energy in mind, I felt obligated to once again tackle the problem of value and to mathematically elaborate the measurement of technical change through the two-sided valuation. To my great satisfaction I found a solution as shown in *Reappraisal*.

To conclude the description of my time as a student, which was so focused on Ricardo, I would like to quote Schumpeter once again. While reading his *History* I came across the following passage:

⁷³ I promised to make it clear that Ricardo and Malthus were close to solving the problem of value. I would therefore like to refer you once again to Ricardo's *Principles*. Chapter XX *Value and Riches, their Distinctive Properties* begins with a text that nicely expresses the solution. That text is also included in the *Postscript* of *Reappraisal*.

⁷⁴ A. Moons, *Note to "On Absolute Value and the Value in Exchange of Commodities"*, published on www.davidricardo-firstprinciple.com.

⁷⁵ *History*, p. 472-3.

⁷⁶ See also p. 9 of *Reappraisal*.

But as early as 1516, it occurred to Sir Thomas More (Utopia, ...) that for competition to prevail it is not necessarily sufficient that a commodity be sold by more than one seller. Prices may fail to fall to the competitive level also if sellers are few, quod ... si monopolium appellari non potest ... certe oligopolium est. Thus More introduced the concept of oligopoly.⁷⁷

Now I have Utopia⁷⁸ on my bookshelf. And apparently I missed the word "oligopoly" in the past. Naturally, I immediately looked at the context of the passage. It concerns 'The conversation at Cardinal Morton'. In it, explorer Rafaelo Babellario tells how one insatiable bon vivant can be a disaster for the country by buying up all kinds of fertile fields and driving the labourers and their families away to less fertile fields. These fields must first be sown before the displaced labourers can harvest corn. And when corn production subsequently increases again, the price does not drop, because the landlord, according to Babellario, is so rich that he only has to sell his corn when he likes it and he only likes it when the price pleases him.

You understand that I have exaggerated Babellario's story somewhat, but in fact he describes exactly what Ricardo has indicated so well in his rent theory. It would therefore be more correct to say that the landowner could have lowered his corn price, but he will not do so because he can profit from the fact that the price formation of corn is determined by the least favourable production circumstances. It would be foolish of him to want to sell his corn below market price.

Yet Thomas More's observations are of great importance because Ricardo's rent theory is countered by a theory that maps out the consequences of industrialization, which Ricardo has already initiated in the chapter *On Value*. In many respects, this theory is the opposite of the rent theory. Instead of becoming less efficient, production is becoming increasingly efficient due to industrialization. Instead of more and more, less and less labour is needed to produce a fixed quantity of commodities. The trend towards higher prices and a lower rate of profit could therefore give way to lower prices and/or a higher rate of profit.

But the latter trend is by no means certain, as both in agriculture and industry it remains true that prices are determined by the least favourable production circumstances. The owner of the industrial firm that starts to produce more efficiently than its competitors will therefore have the power to set prices. He gets the choice: should I lower prices to push the least efficient firms out of the market so that I can increase my market share by producing more, or should I leave market prices as they are and take advantage of relatively high profits? That's how oligopoly really arises, or even better, how oligopolistic competition arises.

But with Holy Thomas More I anticipate "a hopeless search for the Holy Grail" discussed below.

A hopeless search for the Holy Grail

When I graduated, I could hardly convince my supervisors of the value of both theses: one thesis with a complicated and only partially elaborated method to measure technical change, and another that wants to demonstrate equilibrium under a competition mechanism that is at odds with reality. With disappointingly low grades I left university and could forget about a career in science.

⁷⁷ *History*, p. 305.

⁷⁸ T. More, *Utopia*, translated by P. Silverentand, Athenaeum, Amsterdam, 2008.

Nevertheless, time was on my side, I quickly got the opportunity to put my knowledge into practice. In August 1974, the Central Planning Bureau published a paper with the results of a fixed coefficients vintage model for the Netherlands⁷⁹. The idea was derived from a theoretical model by Robert Solow⁸⁰. The study of the period 1959-1973 explains the considerably lower employment growth in the Netherlands after 1964 by the since then stronger increase in real labour costs, that is an increase in wage costs stronger than the increase in production prices. The core of the model, in accordance with Solow, consists of vintages of machinery whose production capacity and labour places remain roughly the same after the year of installation. However, the labour places decrease by a constant percentage as the vintage becomes younger. As a result, replacing old vintages with new ones ensures a sustained increase in labour productivity.

The coefficients of the model are estimated in such a way that, given the actual investments, the calculated profitable production capacity makes the actual production possible, while the calculated number of labour places matches the actual employment. The profitable production capacity and the associated labour places follow from the sum of the vintages whose possible production revenues, given the actual production prices, are sufficient to pay the actual wage costs. This neoclassical condition makes it possible to determine the economic lifetime of machinery each year.

When I read this study it was immediately clear to me: in this model there must be an most profitable lifetime of machinery that is independent of wages and prices and that, with Ricardo in mind, is determined exclusively by the technical production circumstances. What could be easier than to verify that hypothesis, just in the context of that model?

In my studies I learned excellent Fortran from my professor Max Euwe, the former world chess champion. So, it took me little effort not only to reproduce the results of the model, but also to show that there is indeed an most profitable lifetime of machinery. A firm that, given wages and prices, replaces its machines after the most profitable lifetime, produces more efficiently and makes a greater profit per unit product than its competitors that replace their machines after the economic lifetime. That was the first proof that my thinking about Ricardo's ideas was right.

Now that I have used the word neoclassical, you might wonder if Schumpeter also uses that word. Surprisingly, he refers to it only with some reluctance in his discussion of the marginal utility theory, pointing out “the habit, which has developed especially in the United States, of describing the ‘marginalist’ theory as neo-classic. Considering how much of the old framework and the old attitudes was taken over by the ‘marginalists’, we might feel inclined to approve of it”⁸¹. Probably out of respect for Marshall, who considered himself a classical economist, he refused to call the marginal productivity theory neoclassical.

However, I would like to join Mark Blaug's discussion of The Marginal Revolution,

In the theory of the firm, an optimum result is obtained when the marginal physical product of each dollar's worth of factor purchases is equalized; the law of diminishing marginal productivity plays the same role here as diminishing marginal utility in the theory of demand. Both examples are merely particular applications of the ‘equimarginal principle’. The whole of neoclassical economics is nothing more than the spelling out of this

⁷⁹ H. den Hartog and H. Tjan, *Investeringslonen, prijzen en arbeidsplaatsen (Een jaargangenmodel met vaste coëfficiënten voor Nederland)*, Central Planning Bureau, Occasional Papers, No 2/1974.

⁸⁰ R. Solow, *Substitution and Fixed Proportions in the Theory of Capital*, Review of Economic Studies, Vol 29. pp 207-18, 1962.

⁸¹ *History*, p. 919.

principle in ever wider contexts joined with the demonstration that under definite conditions, perfect competition does in fact produce equimarginal allocation of expenditures and resources.⁸²

but only then with Blaug's addition that in this theory Ricardo's "postulate that value is determined by production under 'the least favorable circumstances' was made the basis for the determination of all prices"⁸³.

The vintage model is one of many forms to model the neoclassical theory. But it is precisely this model that will help to further unravel that theory below. The estimation method used in the paper of the Central Planning Bureau assumes, as it were, "perfect competition" in which the profitable production capacity can always meet a corresponding demand, or in other words, in which the industry has to deal with a horizontal demand curve so that, given wages and prices, the demand is always met. In the neoclassical theory it is stated that "'imperfect competition' prevails in an industry or group of industries wherever the individual sellers are imperfect competitors, facing their own *nonhorizontal d(eman)d* curves and thereby having some measure of control over price"⁸⁴.

Samuelson shows how a revenue curve can be derived from a downward demand curve, which reaches a maximum at a certain price. It will then become clear that this price implies a mark-up on the marginal costs of this industry, because without that mark-up, these imperfect competitor would not be present in the market at all. If that price is then higher than the price that follows from the intersection of the curves of the marginal and average costs per unit of production, then according to neoclassical theory there is clearly an inefficient outcome compared to the outcome that is considered efficient under perfect competition.

This imperfect form of competition must be distinguished from the oligopolistic competition that can arise in the vintage model when a firm start to replace its machines after their most profitable lifetime. Wages and prices remain then still determined by the least favourable production conditions. On the oldest machine still in use, the yield of production (price times volume) is equal to the wage sum (wages times labour required). It is therefore very easy to think that, given the available machines, a maximum profit is achieved by keeping them in use as long as profitable. It should be clear that the vintage model can show both forms of 'imperfect' competition. This reveals a profound difference of opinion that can be clarified by the following central question.

Central question

To introduce the central question I would like to share with you the quote from Adam Smith that occupies a prominent place in Paul Samuelson's famous textbook *Economics*,

Every individual endeavors to employ his capital so that its produce may be of greatest value. He generally neither intends to promote the public interest, nor knows how much he is promoting it. He intends only his own security, only his own gain. And he is in this led by an INVISIBLE HAND to promote an end which was no part of his intention. By pursuing his own interest he frequently promotes that of society more effectually than when he really intends to promote it.

ADAM SMITH, *The Wealth of Nations* (1776)⁸⁵

to which Samuelson responds with

⁸² M. Blaug, *Economic Theory in Retrospect*, Second Edition, Heinemann, London, 1968, p. 301.

⁸³ *ibid.*, p. 303.

⁸⁴ P. Samuelson, *Economics*, Ninth Edition, McGraw-Hill, 1973, p. 483.

⁸⁵ *ibid.*, p. 41.

The clue to the Invisible hand paradox is this: Adam Smith would have to rely on strictly defined 'perfect competition' to get his result. As soon as we have imperfect competition in the real world, we have left the Garden of Eden. There then arises the problem of how to minimize the evil and wastes involved in such imperfections of competition.⁸⁶

Although Samuelson acknowledges that perfect competition (where no one has any personal influence on market price) hardly occurs in reality, he does provide a clear description of what he sees as the Garden of Eden.

Under perfectly perfect competition, where all prices end up equal to all marginal costs, where all factor-prices end up equal to values of marginal-products and all total costs are minimized, where the genuine desires and well-being of individuals are all represented by their marginal utilities as expressed in their dollar voting – then the resulting equilibrium has the efficiency property that “you can’t make any one man better off without hurting some other man.”⁸⁷

Samuelson emphasizes the importance of aiming for prices that equal marginal costs: “the concept of Marginal Costs has great importance for *welfare economics*. The problem of How goods are to be produced is being solved most efficiently only if every source of production for a good is being utilized up to the same *MC* level – an optimal result that is achievable when $P=MC$ everywhere”⁸⁸.

Referring to the Marshall-Wicksell analysis, Schumpeter also seems to believe in this picture of “the classic proposition that in the case of perfect competition the profit interest of the producer tends to maximize production. It even supplied almost satisfactory proof”⁸⁹.

But the central question at issue here is whether the idea of perfect competition, under which a great diversity of firms ensures the largest possible production volume by keeping machines in use as long as they yield a profit, is indeed worth pursuing. Does this indeed lead to the most efficient production? Has not this idea, this Holy Grail, in fact been lying in smithereens on the ground for two centuries⁹⁰ by the brainpower of Ricardo? And how is it that this idea of perfect competition has become the yardstick for judging all other forms of competition, which can only produce less efficient outcomes? Does this all appear to be a product of lazy thinking with insufficient regard for reality?

Before starting to answer these sub-questions in which the central question is broken down, I first refer to the figure “Numerous industries are dominated by a very few sellers: ‘oligopolies’”⁹¹, with which Samuelson illustrates his paragraph “The evil of monopoly”. On the other hand, I must also point out his mixed feelings as evident from the “eulogistic words” Samuelson gives to his quote from Schumpeter’s *Capitalism, Socialism & Democracy*:

The modern standard of life of the masses evolved during the period of relatively unfettered “big business”. If we list the items that enter the modern workman’s budget and from 1899 on observe the course of their prices not in terms of money but in terms of the hours of labor that will buy them – i.e. each year’s money prices divided by

⁸⁶ *ibid.*, p. 496.

⁸⁷ *ibid.*, p. 632.

⁸⁸ *ibid.*, p. 462.

⁸⁹ J. Schumpeter, *Capitalism, Socialism & Democracy*, Routledge, London, 1943, p. 77.

⁹⁰ Or a century and a half if we follow Blaug where he says “it took a hundred years before Walras, Marshall, Pigou and Pareto worked out the logic of Smith’s convictions about the workings of “the invisible hand”. Thoughts such as these produce the absolutists who, looking down from presents heights at the errors of the ancients, cannot help but conclude that truth is concentrated in the marginal increment to economic knowledge”, Blaug, *op. cit.*, p. 4. We will refrain from commenting on the last sentence.

⁹¹ P. Samuelson, *op. cit.*, p. 116.

each year's hourly wage rates, we cannot fail to be struck by the rate of the advance which, considering the spectacular improvement of qualities, seems to have been greater and not smaller than it ever was before... Nor is this all. As soon as we go into details and inquire into the individual items in which progress was most conspicuous, the trail leads not to the doors of those firms that work under conditions of comparatively free competition but precisely to the doors of the large concerns – which, as in the case of agricultural machinery, also accounts for much of the progress in the competitive sector – and a shocking suspicion drawn upon us that big business may have had more to do with creating that standard of life than keeping it down.⁹²

Below I will comment on the neoclassical theory as it is represented using the vintage model in *Oligopolistic Competition and Economic Development*⁹³. The model in this paper is estimated for the manufacturing industry in the United States, Germany, France and the United Kingdom. Given the technical nature of the neoclassical views on imperfect competition, I have to refer to the separate paper *On Samuelson's analysis of imperfect competition*⁹⁴ in which I repeat Samuelson's analysis while using the estimation results presented in *Oligopolistic Competition*.

Here I will confine myself to a brief summary of that paper. Using the separate vintages, the curves for the marginal and average costs per unit of production can be determined. According to the theory, the intersection of these two curves determines the price of production that may be expected under perfect competition. The main thing the paper shows, is that production that is called efficient according to the neoclassical theory does not necessarily have to be efficient. As shown in *Oligopolistic Competition*, the most profitable lifetime of machinery, in deviation of the neoclassical economic lifetime, is independent of wages and prices. This does not alter the fact that this most profitable lifetime can also be determined experimentally on the basis of wages and prices. But in addition the paper shows a third way of calculating, namely on the basis of the net production or surplus per worker: independent of wages and prices, labour productivity increases when adding up the vintages up to and including the most profitable vintage, and then starts to decline when machines are kept in use for longer. This yardstick is also used in the paper to examine the neoclassical views on imperfect competition in more detail.

Referring to the numerous oligopolistic industries shown by Samuelson (see footnote 91), the hypothesis here is that these have not emerged by becoming less efficient in production, but on the contrary by making more efficient use of their productive potential. In discussing Schumpeter's analysis of creative destruction we will return to the passage from which Samuelson borrowed the above-quoted eulogy.

In anticipation of that analysis, it must first be stated that wages and prices under the oligopolistic competition that I have in mind, continue to be determined by the equality of marginal costs and marginal revenues, precisely as Ricardo says determined by the least favourable production conditions. *Oligopolistic Competition* therefore distinguishes between Marshallian firms, which keep machines in use as long as the marginal costs are lower than the marginal revenues, and Schumpeterian firms which produce more efficiently than their Marshallian competitors. Because that is what remains. The marginal costs continue to determine wage and price formation, only Smith's delusion falls apart in 'smithereens'.

⁹² *ibid.*, p. 117.

⁹³ A. Moons, *Oligopolistic Competition and Economic Development*, published on www.davidricardo-firstprinciple.com (to be referred to as *Oligopolistic Competition*).

⁹⁴ A. Moons, *On Samuelson's analysis of imperfect competition*, published on www.davidricardo-firstprinciple.com.

One must see that efficient production comes about quite naturally in a situation of “perfect competition”. In this connection, the passage where Schumpeter describes, in my opinion, the rise of Schumpeterian firms in the American automobile industry is very beautiful. In a footnote, Schumpeter mentions this example as illustrating much of his general argument in *Capitalism, Socialism & Democracy*:

The postwar history of the automobile ... industry ... illustrates very well the nature and value of what we may call “edited” competition. The bonanza time was over by about 1916. A host of firms nevertheless crowded into the industry afterwards, most of which were eliminated by 1925. From a fierce life and death struggle three concerns emerged that by now account for over 80 per cent of total sales. They are under competitive pressure inasmuch as, in spite of the advantages of an established position, an elaborate sales and service organization and so on, any failure to keep up and improve the quality of their products or any attempt at monopolistic combination would call in new competitors. Among themselves, the three concerns behave in a way which should be called corespective rather than competitive: they refrain from certain aggressive devices (which, by the way, would also be absent in perfect competition); they keep up with each other and in doing so play for points at the frontiers. This has now gone on for upwards of fifteen years and it is not obvious that if conditions of theoretically perfect competition had prevailed during that period, better or cheaper cars would now be offered to the public, or higher wages and more or steadier employment to the workmen.⁹⁵

These three firms grew in size and survived the life and death struggle primarily by producing more efficiently so that they could profit from the prices set by their less efficient Marshallian competitors. Crucially, Schumpeterian firms are characterized by the presence of entrepreneurs.

An entrepreneur is someone, a person, who sees how to produce a new commodity or an existing commodity more efficiently, and moreover succeeds in effectuating what he or she sees as a possibility. Entrepreneurs are therefore of all times and independent of the form of society in which they operate, a capitalist or a socialist system, it makes no difference⁹⁶. They see that keeping labour and capital in use as long as it yields profit does not necessarily yield the most efficient production. Even though Schumpeter apparently had difficulty freeing himself from the 'marginal' idea as well as from the idea that perfect competition as described by Marshall and Wicksel would lead to efficient production. But for Ricardo, given his first principle, it was clear from the outset that efficient production is independent of wages and prices. Entrepreneurs have the quality to be able to see that.

I would like to quote Schumpeter's description of the function of entrepreneurs to underline again the main point he made at the end of the quote:

The function of entrepreneurs is to reform or revolutionize the pattern of production by exploiting an invention or, more generally, an untried technological possibility for producing a new commodity or producing an old one in a new way, by opening up a new source of supply of materials or a new outlet for products, by reorganizing an industry and so on. ... To undertake such new things is difficult and constitutes a distinct economic function, first, because they lie outside of the routine tasks which everybody understands and, secondly, because the environment resists in many ways that vary, according to social conditions, from simple refusal either to finance or to buy a new thing, to physical attack on the man who tries to produce it. To act with confidence beyond the range of familiar beacons and to overcome that resistance requires aptitudes that are present in only a small fraction of the population and that define the entrepreneurial type as well as the entrepreneurial function. This

⁹⁵ J. Schumpeter, *Capitalism, Socialism & Democracy*, Routledge, London, 1943, p. 90-1.

⁹⁶ I also want to emphasize that my concept of a firm is independent of the form of society. A firm is a community of people focused on the production of one or more types of commodities, such as a fishing community focused on catching various types of fish.

function does not essentially consist in either inventing anything or otherwise creating the conditions which the enterprise exploits. It consists in getting things done.⁹⁷

Well-known and famous is Schumpeter's analysis of Creative Destruction in which he opposes "the theories of monopolistic and oligopolistic competition and their popular variants" that "may in two ways be made to serve the view that capitalist reality is unfavorable to maximum performance in production". According to one way this can be attributed to "a sequence of favorable circumstances unconnected with the mechanism of private enterprise and strong enough to overcome the latter's resistance". Schumpeter convincingly dispels this idea in his chapter *Closed Season*. The other way starts from "an entirely imaginary golden age of perfect competition that at some time somehow metamorphosed itself into the monopolistic age", while "there is nothing in the behavior of the time series of total output to suggest a 'break in trend'; and most important of all, that the modern standard of life of the masses evolved during the period of relatively unfettered 'big business'"⁹⁸. As you can see, this is where the eulogy that Samuelson quoted in his *Economics* begins (see footnote 92).

Schumpeter emphasizes the evolutionary character of the capitalist process: "The fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers' goods, the new methods of production or transportation, the new markets, the new forms of industrial organization that capitalist enterprise creates". He points to the "industrial mutation ... that incessantly revolutionizes the economic structure *from within*, incessantly destroying the old one, incessantly creating a new one. This process of Creative Destruction is the essential fact about capitalism. It is what capitalism consists in and what every capitalist concern has got to live in"⁹⁹.

Schumpeter then emphasizes: "we must judge its performance over time, as it unfolds through decades or centuries. A system ... that at *every* given point of time fully utilizes its possibilities to the best advantage may yet in the long run be inferior to a system that does so at *no* given point of time, because the latter's failure to do so may be a condition for the level or speed of long-run performance".

Given his aversion to "the usual theorist's paper and the usual government commission's report" who, driven by the desire to combat imperfect competition, looked only at prices without any regard for the dynamics described by Schumpeter ("price competition was all they saw"¹⁰⁰), it is understandable, but nevertheless a pity that Schumpeter did not follow the example of Ricardo's method and did not properly consider the consequences of creative destruction for price formation. Then his attention should have fallen on price formation under the least favourable production conditions. Then he could have realised how creative destruction can develop powerfully precisely thanks to that price formation. This does not alter the fact that hidden in the entire part II *Can Capitalism Survive?* a eulogy can be read to oligopolistic competition in the sense of Schumpeterian firms that compete with Marshallian firms at the frontiers of technical possibilities and thus become the drivers of economic development not only in the period of unfettered capitalism, but also in the

⁹⁷ *ibid.*, p. 132.

⁹⁸ *ibid.*, p. 81.

⁹⁹ *ibid.*, p. 83.

¹⁰⁰ *ibid.*, p. 84.

period in which “the atmosphere of hostility to capitalism”¹⁰¹ arose. And even today, Schumpeterian firms continue to make important contributions to economic development¹⁰².

Given Schumpeter's preoccupation with what he saw as hostility to capitalism, it is important to recognize that a firm that has grown big through an entrepreneur can regress to a Marshallian firm if, as Schumpeter fears, managers gain the upper hand and push the entrepreneurs out. Such a big business does not necessarily have to become less efficient than its smaller competitors who also keep their machines in use as long as they yield a profit. Moreover, we often see that these managers of big firms, in the pursuit of profit, divide up their firms and sell them separately. In these split off firms, entrepreneurs can then arise again. There seems no reason to think that capitalism was doomed to end. Why then did Schumpeter have no confidence in the survival chances of capitalism?

I think I should refer here to an earlier quote from Schumpeter in which he refers to Ricardo as “a writer who was quite free from either emotionalism or philosophical preconceptions” (see footnote 58). I would not dare say that so emphatically about Schumpeter. The title *Capitalism, Socialism & Democracy* seems enough to suggest otherwise. In the chapter *Can Socialism Work?* he discusses comparative efficiency, whereby Schumpeter reduces the economic efficiency of a system to productive efficiency: “we shall call that system relatively more efficient which we see reason to expect would *in the long run* produce the larger stream of consumers' goods per equal unit of time”¹⁰³. He briefly repeats his opinion, with some annoyance, about the theorists who blindly believe in “perfect competition”:

Many economist, on the strength of the fact that under completely unrealistic conditions all sorts of flattering propositions can be established about competitive capitalism, have acquired a habit of extolling it at the expense of its “monopolistic” successor.

I wish to repeat therefore that even if those eulogies were entirely justified – which they are not – and if the theorist's perfect competition had even been realized in the field of industry and transportation – which it never was – finally, if all the accusations ever leveled against big business were entirely justified – which is far from being the case – it would still be a fact that the actual efficiency of the capitalist engine of production in the era of largest-scale units has been much greater than in the preceding era of small or medium-sized ones. This is a matter of statistical record. But if we recall the theoretical explanation of that fact, we further realize that the increasing size of units of control and all the business strategy that went with it were not only unavoidable incidents but to a considerable extent also conditions of the achievement reflected in that record; in other words, that the technological and organizational possibilities open to firms of the type which is compatible with approximately perfect competition could never have produced similar results. How modern capitalism would work under perfect competition is hence a meaningless question.¹⁰⁴

Schumpeter calls the answer to the question whether socialism could be more economically efficient “of doubtful validity as long as capitalist evolution is in full swing but it will be decisive as soon as it *permanently* slackens down, whether from reasons inherent in or external to its economic mechanism”¹⁰⁵. The latter mainly concerns managers who push entrepreneurs out, in addition to the

¹⁰¹ *ibid.*, p. 63.

¹⁰² Schumpeter was not the only one who had an eye for oligopolistic competition around him. Duesenberry also points out that an oligopolist must rely on a lower cost level than its rivals. He writes “Construction of new capacity is hard to conceal, but replacement expenditures and research are relatively easy to conceal. ... a firm can hope to build up a sizeable concealed cost advantage or get ahead of its rivals in the development of new products”, op. cit. p. 131-2.

¹⁰³ *ibid.*, p. 190.

¹⁰⁴ *ibid.*, p. 189.

¹⁰⁵ *ibid.*, p. 194.

hostile attitude of society towards large firms, which leads to tensions between the private and public sectors.

What went wrong? Why did the ideal of perfect competition, supposedly essential for efficient production, come under such pressure? Where did this obsession and fight against imperfect competition come from? And this despite the fact that economic performance, as Schumpeter so aptly describes it, has so far rivalled that of countries without a capitalist system.

What went wrong? I think, the mainstream marginal productivity theory of distribution is exemplary. This theory forms the basis for production functions, such as the Cobb-Douglas production function, which are often used to explain the income distribution between labour and capital. In these types of production functions the 'equimarginal principle' (see pages 19-20) could survive for a long time.

I would like to join Schumpeter's criticism:

First of all, he who asserts first-order homogeneity of the production function asserts a fact, at least hypothetically. Since this fact is not implied in any of the other properties that, in general, normally, or for particular purposes we have previously agreed to attribute to the production function, it can be established or denied only by factual evidence if at all.¹⁰⁶

Schumpeter acknowledges, however, that a national production function can also be verified indirectly by "a simple explanation of a remarkable fact, namely, the relative constancy of the main relative shares of 'factors' in the national dividend"¹⁰⁷. Schumpeter then correctly says that technically you do not need the production function (and also no utility function) because you can suffice with:

The fundamental theorem that the marginal productivity (utility) of a dollar's worth of each 'factor' (consumer's good) must be (at least) equal to the marginal productivity (utility) to the firm (household) of the marginal productivity (utility) of a dollar's worth of any other 'factor' (consumer's good) follows in both cases, though in a different garb, whether we use production (utility) function or simply marginal rates of substitution or transformation.¹⁰⁸

This fundamental theorem, which reflects the 'equimarginal principle', is based on the assumption that production must be efficient according to this principle. However, this assumption contradicts the facts as they could be established based on Ricardo's first principle.

But in anticipation of these yet-to-be-determined facts, the inadequacy of mainstream production functions was already apparent from the analysis using the vintage model. This showed how a firm in a world of Marshallian firms that keep their machines in use as long as they generate a profit, may start to produce more efficiently and thus gain the power to influence its competitors' prices. That firm does not leave the Garden of Eden, it rather points the way to it. There is an important caveat here that will come up once we discuss the Solow growth model, which is also a starting point in *Innovation and Growth in the Global Economy* by Gene Grossman and Elhanan Helpman¹⁰⁹.

¹⁰⁶ *History*, p. 1040.

¹⁰⁷ *ibid.*, p. 1042. Blaug notes, by the way: "The long-run constancy of factor shares is a fact that is now being increasingly questioned as a fact. Nevertheless, the belief that the elasticity of substitution in the real world appeared to be unity gave an immediate appeal to the Cobb-Douglas form or its latest relative: 'the constant elasticity of substitution (CES) production function'", *op. cit.*, p. 458.

¹⁰⁸ *ibid.*, p. 1043.

¹⁰⁹ G. Grossman and E. Helpman, *Innovation and Growth in the Global Economy*, MIT Press, Massachusetts, 1992.

Earlier, Sraffa had given a good impetus to an alternative approach to the neoclassical theory in *Production of Commodities by Means of Commodities* that he gave the subtitle *Prelude to a Critique of Economic Theory*. In that book, Sraffa unfortunately gets stuck in describing production in a “self-replacing state”, so that prices can indeed be determined, but without any attention to changes that may occur in production processes over time. Moreover, the central place occupied by the construction of a Standard commodity makes criticism of the “marginal method” hard to find. With the help of this standard commodity, it can be determined exactly which commodity becomes more expensive and which becomes cheaper in the event of a change in the income distribution and the price changes that this entails¹¹⁰. This standard commodity, by the way, has hardly any relation to the “invariable measure of value” that Ricardo was looking for. Blaug, on the other hand, seems convinced that Sraffa has solved Ricardo's problem. He speaks of a solution “that would have astonished Ricardo”¹¹¹. This does not alter the fact that I agree with Blaug's simple question in response to “Sraffa's veritable *tour de force*: what possible economic significance can we attach to a demonstration that it is logically possible to construct a truly ‘invariable measure of value’?”¹¹².

Sraffa's standard commodity is indeed economically hardly relevant, but nevertheless Blaug also shows his blind spot for Ricardo's real intentions here. He places himself in the category that Schumpeter referred to after his exclamation “So the murder is out” (see page 12). But at the same time it is as if Blaug wants to respond to Schumpeter when he demonstrates his irritability: “The whole of the famous chapter on value in the *Principles*, as well as the last paper Ricardo wrote, ... is a muddle”¹¹³, to then agree with Schumpeter: “But so tortuous is Ricardo's exposition that we are likely to deceive ourselves that he has actually substantiated the labor-cost theory of value”¹¹⁴.

But again, the question that Ricardo had in mind in his search for an invariable measure of value was: how can I deduce from the exchange ratios between commodities as they arise on the market which commodity is produced more efficiently at a given moment than before? To answer this question I would like to limit myself to referring to *Reappraisal*. The technical development in the production of commodities in terms of labour required can indeed be measured precisely for each commodity separately by using not necessarily balanced exchange ratios between commodities.

But once again I want to return to Blaug. In contrast to his characterization of neoclassical theory – measurement without theory, he typifies in chapter VIII *A Final Judgement* the criticism of Cambridge as theory without measurement¹¹⁵. We may now conclude that the neoclassical theory is henceforth opposed by theory with measurement.

In the 1970s, when I saw the opportunity to critically question neoclassical theory from within with the help of the vintage model, I of course also witnessed the on-going Cambridge controversy. This

¹¹⁰ For convenience, I assume that all consumer commodities are also needed as intermediate commodities in the production processes.

¹¹¹ M. Blaug, *The Cambridge Revolution: Success or Failure? A Critical Analysis of Cambridge Theories of Value and Distribution*, The Institute of Economic Affairs, 1974, p. 22. Blaug was not the only one who thought that Sraffa had solved Ricardo's problem. Maurice Dobb for example writes: “Thus what was conceived to be a central problem of classical political economy in Ricardo's day has been solved a century and a half later. In the absence of a solution there could be no way of distinguishing in the case ‘of any particular price fluctuation whether it arises from the peculiarities of that commodity which is being measured or from those of the measuring standard’.”, M. Dobb, *Theories of value and distribution since Adam Smith*, Cambridge University Press, 1973, p. 265-6. Luigi Pasinetti, on the other hand, does give a correct representation of Ricardo's intentions. According to him, Sraffa's standard commodity is only “a commodity the value of which is invariant to changes in income distribution”, L. Pasinetti, *Structural change and economic Growth*, Cambridge University Press, 1983, p. 105.

¹¹² *ibid.*, p. 22.

¹¹³ M. Blaug, *Economic Theory in Retrospect*, op. cit., p. 103.

¹¹⁴ *ibid.*, p. 103.

¹¹⁵ M. Blaug, *The Cambridge Revolution: Success or Failure?*, op. cit., p. 80-1.

included, among other things, double-switching “discussions, which, *technically*, relate to simple (!) questions such as: ‘Can factor-price frontiers cross more than once?’ and ‘What is the shape of the factor-price frontier?’¹¹⁶. Given the technical nature, this discussion is also briefly addressed in the paper *On Samuelson’s analysis of imperfect competition* where the factor-price frontier is discussed as it can be derived from *Oligopolistic Competition*.

Here another point of discussion demands our attention which Geoff Harcourt describes using a figure with the caption “Kaldor’s ‘Keynesian’ theory of distribution”¹¹⁷. To introduce it Harcourt writes:

An integral part of Kaldor’s result is his view that the share of profits in *full-employment* national income may be explained by the *share* of investment in national output, provided only that investment itself is determined by long-run growth forces, that the saving propensities of profit-receivers are greater than those of wage-earners and that industrial market structures are sufficiently competitive to allow prices to respond to changes in demand. Especially must it be supposed that prices are *more* flexible than *money* wages at any moment of time.¹¹⁸

Assuming a full-employment equilibrium and, for convenience, a propensity to save out of wages equal to zero and a fixed investment share in national income, Harcourt shows from his figure that in case the savings out of profits exceed investment a fall in prices will induce a fall in savings until they equal investment, and vice versa in case of a shortage of savings a rise in prices will result in a return to equilibrium. In this equilibrium, the share of profit equals the share of investment divided by the propensity to save from profits. This means that the lower the propensity to save, the greater the profit share. Only if the capitalists consume nothing and invest everything, the profit share is equal to the share of investments in national income.

Although Harcourt rightly notes that “Kaldor’s assumption of full employment has puzzled many people”¹¹⁹, I am particularly intrigued by the similarity with steady state analyses in which the (neoclassical) vintage model also shows that an increasingly higher propensity to save is accompanied by a correspondingly lower rate of return. Moreover, Nicolas Kaldor shows in *A Model of Economic Growth*¹²⁰ in detail how his analysis accounts for remarkable historical constancies, not only pointing out that “the share of profits in the national income has shown a remarkable constancy in ‘developed’ capitalist economies of the United States and the United Kingdom since the second half of the nineteenth century”, but also the trend rates of increase of both the capital equipment per worker and output per worker, “so as to leave the capital/output ratio virtually unchanged over longer periods”¹²¹.

In addition to Harcourt’s description, Kaldor also uses a technical progress function in his model which, whenever there is an upward shift, calls for a process whereby the extra production possibilities are used to grow towards the old level of the capital/output ratio. In conclusion, I would like to give Kaldor’s own summary of his model:

¹¹⁶ G. Harcourt, *Some Cambridge controversies in the theory of capital*, Cambridge University Press, 1972, p. 119.

¹¹⁷ *ibid.*, p. 209.

¹¹⁸ *ibid.*, p. 207.

¹¹⁹ *ibid.*, p. 210. Blaug is also clear: The Kaldor theory has been scathingly received by almost everyone, including other members of the Cambridge School”, *The Cambridge Revolution*, op. cit., p. 62.

¹²⁰ N. Kaldor, *A Model of Economic Growth*, *Economic Journal*, LXVII, pp. 591-624.

¹²¹ *ibid.*, p. 591-2.

Our model thus relates to a capitalist economy which is sufficiently highly developed for wages to be above subsistence level and sufficiently competitive at the same time to generate adequate demand to secure full employment.

Assuming these conditions are satisfied, our technical progress function indicates the growth of income and capital from $t=1$ onwards, and the gradual movement of the economy from a short-period equilibrium to a long-period equilibrium of steady growth.¹²²

I will return to the intriguing similarity between steady state analyses above later. Here the puzzling assumption of full employment takes us back to the 1970s when unemployment after 1973, especially in Europe, began to become an increasingly pressing problem.

In order to reinforce the policy recommendations of the Central Planning Bureau, the vintage model discussed above was incorporated in a macro-economic model of the Dutch economy as a whole in 1975¹²³. The analysis that employment in firms in the Netherlands had come under pressure due to the relatively strong increase in real labour costs since 1964 (i.e. wage costs that increase more than the sales prices of the production of firms) thus became decisive for the outcomes of the policy variants. The model predicted major employment effects from “an autonomous reduction in nominal wage growth over 3 consecutive years, for example by introducing a threshold in price compensation.” Although it was added to this: “A much more drastic measure is of course a central intervention in the (macro) wage formation, as happened for example in the fifties”. However, the model also showed significant employment effects from a reduction in VAT rates such that the consumer price falls for three consecutive years. Given the indexation of wages to prices, a reduction in wage costs follows. After five years, this results in an employment effect equal to two-thirds of the effect of autonomous wage moderation.

As a civil servant, I was able to temper these expectations by pointing out that the rise in unemployment was mainly caused by contraction processes towards the most profitable lifetime, which are not necessarily or at most temporarily slowed down by policies aimed at extending the economic lifetime. Moreover, these contraction processes can lead to long-term unemployment. Once again, I was able to produce a shadow model. This not only allowed me to reproduce the outcomes of the policy variants of the Central Planning Bureau, but also how the outcomes of these variants change if contraction towards the most profitable lifetime is taken into account. With this shadow model, I was also able to contribute to a change in policy that was more focused on promoting investments, and which, according to the Dutch central bank, ultimately became a victim of its own success as a result of rising budget costs.

As the study by Richard Layard, Stephen Nickell and Richard Jackman shows, the problem of unemployment, especially in Europe, has many facets¹²⁴, which are partly related to structural changes in the manufacturing industry, such as the disappearance of firms in, for example, the textile industry or shipbuilding due to competition from countries where, given the wage level, production is at lower costs, or because firms themselves move to those countries to produce there. But one can also think of firms that concentrate on the development of new products while their normal production was increasingly realized by subsidiaries in low-wage countries.

¹²² *ibid.*, p. 609.

¹²³ H. den Hartog, Th. van de Klundert and H. Tjan, *De structurele ontwikkeling van de werkgelegenheid in macro economisch perspectief*, in WERKLOOSHEID Aard, omvang, structurele oorzaken en beleidsalternatieven, Martinus Nijhoff, 's Gravenhage, 1975.

¹²⁴ R. Layard, S. Nickell and R. Jackman, *Unemployment – Macroeconomic Performance and the Labour Market*, Oxford University Press, 1991.

‘The problem of declining industries’, you will understand, cannot be properly understood without distinguishing between Schumpeterian and Marshallian firms. A comparison with the analysis of Layard, Nickell and Jackman is telling, with the following quote at its core:

The key problem is in the labour market and revolves around the issue of what stops wages falling when there is an excess supply of labour. There can be two classes of explanation. Either firms are not free to choose the wage, and wage bargaining forces them to pay more than they wish; or, if firms are free to choose and still pay more than the supply price of labour, it must be in their interest to do so.¹²⁵

Their efficiency-wage model shows why firms may offer wages above the market-clearing level. In explanation they point to “the fact that wage of otherwise identical workers differ widely between firms and industries, and when individual workers move to ‘high-wage’ industries most of them get wage increases. The high-wage industries are mostly those where the morals of the workers matters more: they use valuable equipment, or their performance is more difficult to monitor”¹²⁶. And further: “In the USA, ‘efficiency’ considerations may well be the main source of non-market-clearing wages”, but in all European countries unions are important. “Unions have every incentive to set wages above market-clearing levels”, especially in “the case where bargaining occurs in a decentralized way between each firm and its own union members”¹²⁷. According to Layard, Nickell and Jackman, this insider power explains the origin of unemployment but not the persistence of unemployment. This, they argue, is mainly due to outsiders who are insufficiently encouraged by the benefit systems to actively seek work themselves. If they were to actively seek work, they could put downward pressure on wages.

I myself think that Layard, Nickell and Jackman overestimate the power of the unions and that it also applies to Europe that Schumpeterian firms can easily keep wages at the same level and invest in the future with motivated personnel without worrying too much about the outdated Marshallian firms that cannot compete, let alone wanting to help those firms by acquiring them. But also with regard to outsiders, Layard, Nickell and Jackman show an apparently indestructible belief in market forces. They reject the concern that the process of industrial restructuring could lead to persistent unemployment. They respond to this popular view with: “People seem constantly to forget the massive restructurings of the past, such as the huge exodus from European agriculture in the 1950s and 1960s which was accompanied by so little unemployment”¹²⁸. But here Layard, Nickell and Jackman seem to be showing signs of tunnel vision. Apparently, they are so convinced of their analysis of European unemployment that they fail to recognize the dynamics at the time that caused an exodus from agriculture. New, fast-growing firms, which can also increase the employability of all types of labour, have a great attraction for people and generate additional labour supply, especially from sectors with hidden unemployment, as the 1950s and 1960s showed.

Given the starting points offered by the analysis of Layard, Nickell and Jackman and the new industries that have developed, particularly in the USA, there is every reason to view the development of unemployment in a broader perspective. However, I did not feel called to do so at the time. Instead, I concentrated on my work as a policy advisor. Nevertheless, I felt it was important to do what was necessary to enable others to carry out the analyses that need to be done and where

¹²⁵ *ibid.*, p. 22.

¹²⁶ *ibid.*, p. 24.

¹²⁷ *ibid.*, p. 25.

¹²⁸ *ibid.*, p. 295.

Ricardo's insights can be fully utilised, for example with regard to efficient production and the associated most profitable lifetime of machinery.

I was thinking, among other things, about analyses of international trade, where industry in some countries is more efficient than in others. More specifically, I was thinking about the hypothesis that efficient Schumpeterian firms in countries with a rising currency gain a competitive advantage precisely because of that appreciation, allowing their market power to exert more pressure on less efficient Marshallian competitors in countries with a falling currency. That is why I started working in the evenings on developing a software package that makes it possible to properly test these types of hypotheses and, for example, to clearly visualize the international competition of the globally operating automotive industry.

The software, Integrated System for Interpretative Simulation (ISIS) as I call it, which consists of three levels: database management, estimation and simulation, is ready for use. The core of ISIS is formed by Fortran software, surrounded by an extensive C++ shell which ensures optimal user-friendliness so that first-year students can immediately perform the analyses they want. I myself lacked the time to go further than the calculations as shown in *Oligopolistic Competition*.

This study, however, does provide reason to return to the question of why Ricardo's insights have not seen the light they deserve for two centuries. I take the liberty of quoting from my own work only to draw attention to statements made by William Baumol.

Wrestling with the place of entrepreneurship in economic theory Baumol has stressed that the neoclassical model of the firm is "essentially an instrument of optimality analysis of well-defined problems, and it is precisely such (very real and important) problems which need no entrepreneur for their solution"¹²⁹.

This is very clear from the Solow growth model, in which growth, given the technical production possibilities, is made dependent on the choices of households: is preference given to consumption or is money also made available for investments. Solow himself adds:

But I would rephrase the statement to say, roughly, that if there are two initially identical economies and one of them succeeds in consuming less of its output than the other, then after some lapse of time the return on investment will be lower and real wages higher in the high-saving economy than in the low-saving economy¹³⁰.

In *Oligopolistic Competition* this statement is clarified in figure 1 which is copied below. The graph shows that as more is saved and consequently more invested in an economy with a constant labour supply, marginal productivity and thus real wages increase, while gross and net output also increase. But at the same time, the increasing share of wages in net output also means that the return on investment, as reflected in the 'net capital income', leaves less and less room for consumption.

Figure 1 also shows that with increasing investments, the net production per worker reaches an optimum at some point. At that point, the economic lifetime of machines becomes equal to the most profitable lifetime.

Oligopolistic Competition shows that economic development is not determined by the saving behaviour of households, where the entrepreneurs do nothing more than buy machines with those

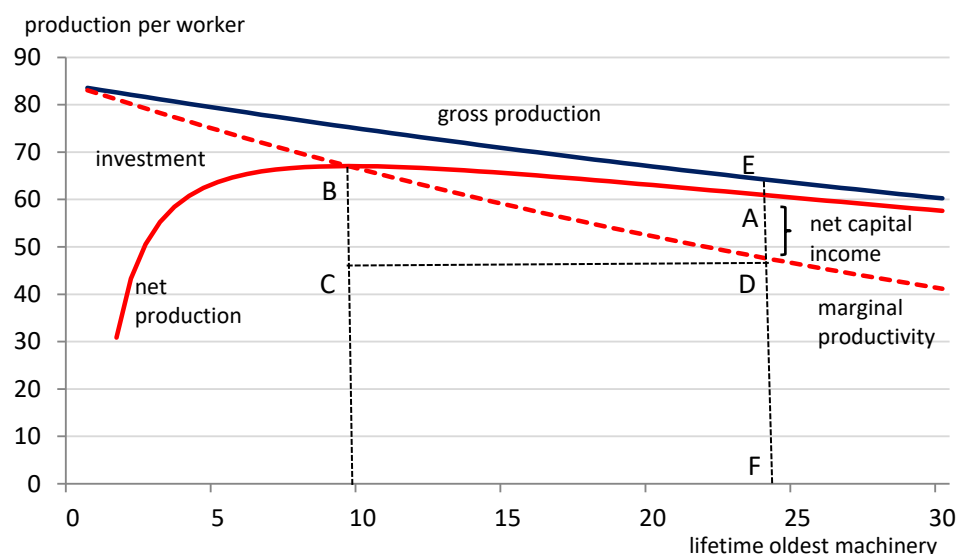
¹²⁹ *Oligopolistic Competition*. The quote comes from W.J. Baumol, *Entrepreneurship in economic theory*, The American Economic Review, vol. 58, p. 64-71, 1968.

¹³⁰ R. Solow, *Capital Theory and the Rate of Return*, North-Holland Publishing, Amsterdam, 1971, p. 36.

savings and then keep them in use as long as they yield a profit. Those entrepreneurs, those Marshallian firms, will indeed exist. And suppose that the savings in the economy of figure 1 are such that it is profitable to keep the machines in use for 24 years, then there is nothing in such an economy that prevents a firm from producing more efficiently by replacing its machines earlier. This is the core of *Oligopolistic Competition*: such a Schumpeterian firm gains market power over its Marshallian competitors through its more efficient production.

Figure 1

Gross and net production per worker and his marginal productivity in stationary states classified after the lifetime of the oldest machinery in use



The figure reflects the estimated production technology of US manufacturing industry in 1997 (current prices, \$ thousand)

The idea that entrepreneurs can enforce savings by producing more efficiently, this possibility that follows directly from Ricardo's first principle, remained shrouded in obscurity for two centuries. Convenience led to looking first at savings when it comes to the question of what is crucial in the explanation of capital accumulation. Convenience that is inspired by the assumed evidence that, given wages and prices, only that production is efficient for which marginal revenues equal marginal costs. Even Oiko in Edmund Phelps' fable¹³¹ assumes without further ado that idea when answering the question of what part of production should be used for investments in order to obtain an optimal level of consumption. Apparently with in-depth knowledge of the Solow growth model, Oiko arrived at the golden rule of accumulation: "Along the optimal golden age path, under conditions of natural growth, the rate of investment is equal to the competitive rate of profits"¹³².

With Oiko's inspiring words still ringing in their ears, the Solovian people pressed the King for a program to attain the golden-rule path. So the King proclaimed golden-rule growth an national purpose and instituted special levies. Once the golden-rule path was reached, investment was continuously equated to profits and Solovians enjoyed, ..., maximum social welfare ever after.¹³³

Personally, however, I would not choose the government role with 'special levies'. My advice would be: promote competition so that Schumpeterian firms can force their Marshallian competitors to

¹³¹ E. Phelps, *The Golden Rule of Accumulation: A Fable for Growthmen*, The American Economic Review, Vol. 51, 1961, p. 638-43.

¹³² *ibid.*, p. 641.

¹³³ *ibid.*, p. 643.

reduce their production, but at the same time allow them to use the extra profit they obtain by producing more efficiently to, for example, push the boundaries of technical possibilities through research so that in the long term even more room for consumption is obtained. Ultimately, this leads to a situation as shown by point B in figure 1.

Nevertheless, Grossman and Helpman go a step further than Oiko. They opt for an endogenously determined savings rate: “Whereas Solow imposed an exogenous link between savings and income, we will assume now that households allocate spending over time so as to maximize an intertemporal utility function.”¹³⁴ Grossman and Helpman assume that households have a perfect view of the development of technical production possibilities to infinity and that this knowledge enables them to provide the firms with the resources they need for investments in order to be able to produce the flow of consumer commodities desired by the households as efficiently as possible. Thus, to quote a well-known politician: the households have the cards.

With their 'optimal saving' they reformulate the Solow growth model and also arrive at the stationary growth economy described by point B in figure 1: “The perfect-foresight, competitive equilibrium is efficient in the neoclassical economy because there are no market distortions to cause any misallocation of resources”¹³⁵.

Grossman and Helpman thus appear to be candidates for the award of the Magna Charta as Schumpeter described it¹³⁶. Schumpeter focuses on “an economic process which merely reproduces itself at constant rates”. And he goes on:

The first and foremost task of economic analysis is to explore the properties of that system. ... What we want to learn before anything else is whether or not the relations known to subsist between the elements of the system are, together with the data, sufficient to determine these elements, prices and quantities, uniquely. For our system is logically selfcontained only if this is the case: we can be sure that we understand the nature of economic phenomena only if it is possible to deduce prices and quantities from the data by means of those relations and to prove that no other set of prices and physical quantities is compatible with both the data and the relations. The proof that this is so is the magna charta of economic theory as an autonomous science.¹³⁷

Grossman and Helpman then further expand their Solow growth model by assuming an expanding product variety on the one hand and a rising product quality on the other. In both cases they present “models of endogenous growth based on intentional industrial innovation. Here, and in the remainder of the book, we treat commercial research as an ordinary economic activity that requires the input of resources and respond to profit opportunities. Returns to R&D come in the form of monopoly rents in imperfectly competitive product markets”¹³⁸. In both cases, the households remain endowed with perfect foresight and, in a beautiful mathematical way, account is now taken of “households’ tastes for diversity in consumption”¹³⁹ and then again with the way in which households value the differences in the quality of, for example, mobile phones, where consumers “are willing to pay a premium for the superior, state-of-the-art product”¹⁴⁰ unless the price gets too high.

¹³⁴ Grossman and Helpman, op. cit., p. 27.

¹³⁵ *ibid.*, p. 35.

¹³⁶ J. Schumpeter, *Business cycles A Theoretical, Historical and Statistical Analysis of the Capitalist Process*, McGraw-Hill, New York, 1939

¹³⁷ *ibid.*, p. 13.

¹³⁸ Grossman and Helpman, op. cit., p. 43.

¹³⁹ *ibid.*, p. 45.

¹⁴⁰ *ibid.*, p. 90.

But it is characteristic that in order to finance R&D in their analysis, prices are needed that are above the level of marginal costs. Perfect competition that ensures prices equal to marginal costs would in their view and the resulting mathematical construction lead to a dead duck. After all, Grossman and Helpman “assume that each known variety of differentiated product is manufactured by a single, atomistic firm”¹⁴¹ This assumption implies a downward-sloping demand curve that all firms of differentiated products enables to set their prices above their marginal costs. But also in the case of a rising product quality their analysis relies “on the assumed absence of any competitive sectors of the economy. If such sectors existed, then the market equilibrium would entail too little output of the innovative products because these goods are priced above their marginal costs of production”¹⁴².

Moment of reflection

At this point I ask you, the reader, to step back and, with this wonderful book *Innovation and Growth in the Global Economy* in hand, ask yourself: what am I looking at? What concept of equilibrium is contained in this book? Does it surpass the concept of equilibrium in Oiko’s Golden Rule of Accumulation? After all, that also seems to be a candidate for Schumpeter’s Magna Charta of economic science.

Schumpeter's explanation of his equilibrium theory provides a foothold. “What matters to us is precisely the presence or absence of an actual tendency in the system to move toward a state of equilibrium: if this concept is to be useful as a tool of business cycle analysis, the economic system must strive to reestablish equilibrium whenever it has been disturbed”¹⁴³. He focuses mainly on the question of which behaviour of firms and households contributes to this. An equilibrium-restoring behaviour is easy to imagine and to describe “in the special case of perfect competition. This case is defined by the conditions (a) that no seller or buyer is able to influence the price of any commodity or factor by his own action and that there is no concerted action, and (b) that there is perfect mobility of commodities and factors all over the economic field”¹⁴⁴.

But even if both conditions of perfect competition are not met, an economic system can “strive to reestablish equilibrium whenever it has been disturbed”¹⁴⁵. For example, in agriculture, price changes may only lead to changes in production after some time, because the next harvest must first be awaited. With such delays “it is theoretically conceivable that it will never stop and that prices and quantities will, without any new disturbance and under conditions of perfect competition, fluctuate indefinitely around equilibrium values without ever hitting them”¹⁴⁶.

Schumpeter outlines a number of possibilities from which equilibrium-restoring behaviour can be demonstrated. And also what can disrupt it. The essence is how prices are responded to over time.

Of course we do not attribute omniscience to our firms and households, or any theoretical understanding of the processes in which they play a part, but simply that amount of information and understanding which they actually possess and which varies greatly between different groups. ... The assumption really made is that people react to existing prices only, and it is from this that trouble arises as soon as we start analysis from a state of disequilibrium or investigate the effects of any disturbance that is more than an isolated interruption of the

¹⁴¹ *ibid.*, p. 49.

¹⁴² *ibid.*, p. 103.

¹⁴³ J. Schumpeter, *Business cycles*, p. 16.

¹⁴⁴ *ibid.*, p. 15.

¹⁴⁵ *ibid.*, p. 14.

¹⁴⁶ *ibid.*, p. 17.

ordinary routine. It is then that expectation or anticipation enters the picture, to threaten the existence of our equilibrium tendency.¹⁴⁷

But I would also like to build a bridge to the analysis of Grossman and Helpman. What behaviour is assumed here? They write: “Entrepreneurs invest in research in order to capture the quasi-rent from having a (temporary) technological lead in their industry. In making their investment decisions, the entrepreneurs recognize that, eventually, they too will be displaced by (further) innovations”¹⁴⁸ Does this concern the possibility that “an external agent has achieved a single technological breakthrough”¹⁴⁹ or that there is a competing entrepreneur who takes over the lead? Where innovation requires imperfect competition, the following observation by Schumpeter is also important.

The very essence of monopolistic competition is in the fact that the price at which a quantity can be sold at any time is a function of the behavior both of the firm itself and of all the other firms in the field. We can gain, however, in the direction of competition, some of the ground we thus lose in the direction of monopoly : since in practice almost every firm either actually produces, or at very short notice is able to produce, any of a wide variety of commodities or qualities, some of which are, as a rule, almost perfect substitutes for the products of its competitors, its price and quantity adjustments will not in general differ fundamentally from those that it would have to make under conditions of perfect competition. That is to say, the demand curves for the products of individual firms will, in general and in the long run, display a high elasticity, though not the infinite one of the pure logic of competition. And this, in turn, will enforce approximate realization of the results of perfect competition that follow from it — in particular, differences in the prices of different qualities or types will tend to correspond to the differences in the costs that must be incurred in producing them.¹⁵⁰

From his explanation of the Magna Charta it is clear that the theory of equilibrium is no more than a first step:

Now, what causes fluctuations may either be individual shocks which impinge on the system from outside, or a distinct process of change generated by the system itself, but in both cases the theory of equilibrium supplies us with the simplest code of rules according to which the system will respond. This is what we mean by saying that the theory of equilibrium is a description of an apparatus of response. It is no more than a first step toward such a description, but even so it is just as important for the study of fluctuations as is the theory of disturbing events or disturbing processes itself.¹⁵¹

With Schumpeter's vision in mind, how should we assess Grossman and Helpman's impressive book? However beautifully and evenly formulated their final chapter is, I think the mathematical construct on which the book is based raises reservations. It already starts with the supposed perfect foresight of households. This does not concern the actual reality, but only the fictitious reality as it is contained in the mathematical construct. The same mathematical construct that is central to Samuelson's *Economics* in which, in addition to the ideal of perfect competition that is supposed to result in efficient production by striving for equality between marginal costs and marginal revenues, an imperfect reality is assumed consisting of monopolistic competition in which many companies can set their prices above the level of their marginal costs precisely because of this supposed imperfect competition. By assuming perfect foresight leading to optimal saving of households, Grossman and Helpman take Samuelson's analysis to a higher level and lift the entire production to point B of figure 1. Thanks to perfect foresight, this efficient production continues forever because the extra profit,

¹⁴⁷ *ibid.*, p. 19.

¹⁴⁸ Grossman and Helpman, *op. cit.*, p. 109.

¹⁴⁹ *ibid.*, p. 110.

¹⁵⁰ J. Schumpeter, *Business cycles*, p. 16.

¹⁵¹ *ibid.*, p. 27.

resulting from the supposed monopolistic competition, allows R&D expenditures that automatically generate a continuous stream of innovations.

But here I would like to argue, in line with Schumpeter's recommendations, for an analysis of the behaviour of firms and households from year to year, taking into account all the disturbances that may arise over time and which may themselves also provide an impetus for innovation. I would also like to refer again to the paper *On Samuelson's analysis of imperfect competition* which not only raises questions about the assumed negative demand curves, but also shows that efficient production according to Ricardo's first principle is independent of wages and prices.

My advice for an alternative study of innovation and growth would be: first, get rid of the fable of households with perfect foresight, and second, recognize that we are not at point B in figure 1, but are merely moving toward it. Moreover, point B also shifts again and again as innovations push the boundaries of technically possible production. In this ever-changing situation it is important to look for patterns as Kaldor did after a shift in his "technical progress function". Are there more equilibrium-restoring forces at work? Is there still a relationship between higher savings and a lower rate of profit? But it is also important to recognize patterns in the distribution of knowledge among firms. But in any case, the analysis seems to have to start with a distinction between firms: firms that produce more efficiently and therefore more profitably than their Marshallian competitors, and these Schumpeterian firms can use their extra profit to search for new products or production processes that yield even more profit. This requires a good description of entrepreneurial behaviour that either has insight into what is technically possible or that knows what research is needed into suspected technical possibilities. But it will always be characteristic that new products or production processes will lead to greater efficiency unless there are new products that require more labour but do meet consumer demands.

The description of entrepreneurial behaviour can then show how the prices on the market for mobile phones, for example, are not determined by monopolistic competition but by the firms that supply the market with the least advanced phones. The preferences of households then determine to what extent they are willing to pay higher prices to firms that offer more advanced mobile phones. This is pure competition in which the front runners make their own considerations: are they going to outcompete the laggards or keep their prices relatively high. Because the front runners are often also in the position that they produce more efficiently than the laggards. After all, only more efficient production ensures a lasting position on the market and not a nice colour or an attractive design. The quality ladder of Grossman and Helpman is therefore a useful concept. This also applies to product differentiation in which differences in efficiency determine the development over time. But it is, as Schumpeter said above: even in monopolistic competition, the behaviour of individual firms will be aligned with the behaviour of "all other firms in the field," especially if its products are "almost perfect substitutes for the products of its competitors".

Near-perfect competition also occurs if more efficiently producing firms gain market power over less efficient firms. The latter firms determine the prices. The efficient firms can set their prices lower, which means that the least efficient firm has to stop production. But the prices continue to be determined by the firm that is doing slightly better. It would be better to speak of pure competition if condition (a) in the definition of perfect competition¹⁵² in accordance with Ricardo is replaced by the

¹⁵²Condition (a): no seller or buyer is able to influence the price of any commodity or factor by his own action and that there is no concerted

condition that “the exchangeable value of all commodities ... is always regulated ... by those who continue to produce them under the most unfavourable circumstances”¹⁵³. Meaning – by the most unfavourable circumstances, also the conditions under which the least advanced product of Grossman and Helpman's quality ladder is produced.

At the end of their book, Grossman and Helpman ask “What Are the Forces That Drive Economic Growth in the Long Run?” You will understand that my answer is clearly different from theirs, that is: “Thus monopoly profits provide the impetus for growth, just as in the Schumpeterian process of “creative destruction”¹⁵⁴. I have already indicated above that Schumpeter in his analyses seems implicitly imbued with the correctness of Ricardo's first principle. It is the entrepreneurs who know how to produce more efficiently who are the real driving force behind economic growth. The initial unfettered development of capitalism (with apparently perfect competition) was not halted by monopolistic competition but continued uninterrupted, either in the form of pure competition, or, if you prefer, in the form of oligopolistic competition.

The final chapter by Grossman and Helpman also contains the question “Is the Equilibrium Growth Path Socially Efficient?” That question reminded me of Solow. Regarding the problem “what difference does it make to calculations of the social payoff to investment when we recognize that technology does change?”¹⁵⁵ there are at least three basic aspects according to him.

The first concerns “not only the theoretical side of things but also the empirical procedures by which one tries to isolate in statistical data the influence of changing technology”¹⁵⁶. That problem has now been resolved, see *A Reappraisal of Ricardo's Principles - On measuring technical change*, which also includes a systematics for dealing with investments.

The second question concerns “how to define and calculate the rate of return on investment”. Solow rightly notes that the assumption of a stationary state is unrealistic here: “output may rise with unchanging inputs”. The systematics of how to deal with investments demonstrates that the rate of return of an investment can only be determined over time. Only then will it become clear to what extent the direct and indirect labour bestowed on the investment more than pays for itself in the labour savings it generates.

The third and still intriguing question is “whether there is a tendency for the private and social rates of return on investment to diverge”. And Solow continues “when technical progress is going on, there are new and different ways in which social and private return can diverge and it is important for policy reasons to be able to distinguish situations in which there is a presumption that the private economy will over- or under-invest from situations in which there is no such presumption”¹⁵⁷.

I myself like to use the metaphor of two cities in ancient times on either side of a fast-flowing and difficult to navigate river, with one bank having a lot of fertile land, while the other is rich in raw

action. See also p. 34.

¹⁵³ Ricardo, *Principles*, p.73.

¹⁵⁴ Grossman and Helpman, op. cit., p. 335. By the way, in the first chapter *Growth and Technology* the authors quote on page 5 Schumpeter's *Capitalism, Socialism & Democracy*: a quote that once again underlines my conclusion about who the drivers of economic growth are.

¹⁵⁵ R. Solow, *Capital Theory and the Rate of Return*, op. cit., p. 39.

¹⁵⁶ *ibid.*, p. 40.

¹⁵⁷ *ibid.*, p. 40-1.

materials. As soon as building a bridge becomes technically possible, it is conceivable that private investments on both sides of the river will pause and entrepreneurs will wonder whether they will benefit or suffer from the bridge. However, once construction of the bridge has actually begun and it becomes clear when the bridge can be put into use, entrepreneurs will make those investments that will enable them to benefit from the comparative advantages that a greatly increased trade between the two banks of the river will bring.

In the current era, we also face the challenge of building a bridge to a truly sustainable economy that ideally should encompass the entire world. But even if the world fails to act together and large countries do not participate and continue their harmful exploitation of nature, it is still crucial to keep working on that bridge. When it comes to adapting consumer behaviour, there is considerable freedom among countries to determine their own pace towards sustainable consumption. They could even push for a policy that ensures, at some point in the future, only new cars that do not use fossil fuels are allowed to be purchased. However, the question then remains whether these cars themselves will be produced sustainably. For example, is the steel used for the production of electric cars also produced in a sustainable manner?

Here, competitiveness between industries in different countries plays a crucial role. Moreover, heavy industry, in particular, is the source of significant CO₂ emissions in many countries. Steel production usually begins in capital-intensive blast furnaces where iron ore is deoxygenated by contacting it at high temperatures with carbon obtained by converting coal into coke. It's clear that this iron production process releases a lot of CO₂. Making steel from iron requires even more energy.

A steel mill of the future is being built in Sweden, aimed at producing 5 million tons of steel per year from 2030. In fact, it involves three plants where, first, water is split into hydrogen and oxygen using electrolyzers. Then, using hydrogen, the iron ore is stripped of oxygen, releasing only H₂O instead of CO₂ in the old blast furnaces. Finally, the reduced iron ore pellets, called DRI, are mixed with scrap and melted in molten steel in electric arc furnaces, where alloys are added. By replacing coal with green hydrogen and electrifying the steelmaking process Stegra will be able to cut CO₂ emission by up to 95 per cent to traditional steel making. The cost of starting with this new production method amounts to approximately 6.5 billion euros¹⁵⁸.

Global steel production in 2024 was expected to reach 1.88 billion tons, with more than half of that produced in China. Considering the cost of just switching to sustainable production of 5 million tons of steel, huge sums are needed for global sustainable steel production. With Solow's last quote in mind, it is difficult to imagine how this could be achieved efficiently in a world of competing steel producers. Perhaps leading countries could take a cue from the creation of the European Coal and Steel Community after the Second World War: by establishing a World Coal and Steel Community, these countries could give a High Authority extensive powers to guide the participating countries' steel markets towards sustainable production in an orderly and efficient manner. Naturally, this Community should always be open to any country wishing to join.

¹⁵⁸ All this information about the Boden plant is taken from www.stegra.com.

Closing remark

Mephistopheles whispered to me more than once: you are absolutely right, those self-righteous economists who think they understand economics, entangled as they are in their mathematical spins. Let them, enjoy your wine. But I could not keep my thoughts away from the economist who knew like no other how to penetrate to the core of efficient production: David Ricardo.