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Cournot's Trade Theory and its Neoclassical Appropriation: Lessons to be Learnt about the Use and Abuse of Models

Eithne Murphy, National University of Ireland, Galway
eithne.murphy@nuigalway.ie

Abstract

This paper seeks to rehabilitate the trade theory of Augustin Cournot. In contrast to the widespread awareness among neoclassical economists of Cournot's contribution to microeconomics, there is general ignorance of his trade theory, which an earlier generation of neoclassical theorists attributed to its erroneous conclusions. I dispute this view and attempt to show the internal consistency of Cournot's trade analysis. While the assumptions underpinning his trade theory could be considered extreme, they need to be understood in the light of his methodological commitments, which included a rejection of utility in the theory of wealth, and a dismissal of Say's law regarding general employment. Furthermore, I argue that the assumptions underpinning neoclassical trade theory are no less extreme, even as their theoretical conclusions are (similarly) logically consistent. All of this serves to highlight the insufficiency of theoretical rigour in establishing the relevance of a theory; the importance of history of thought in reminding us that more than one theoretical perspective exists; and, of course, the indispensability of empirical engagement in trying to arbitrate between contrasting theoretical positions.

Keywords: Cournot, partial equilibrium, international trade, welfare, social income

JEL Codes: B17, B31, F11

1. Introduction

The ubiquitous partial equilibrium model of trade owes its origins to the work of Augustin Cournot. While Cournot's name is a staple in economic textbooks, usually in relation to oligopoly theory, his work on trade has vanished from view. This is all the more surprising, given that the partial equilibrium model that he developed to show the effects of trade, is still in use today, but without attribution. This paper aims to address why this is the case. Key to understanding the neglect of Cournot's trade theory is to realise that he arrived at very different conclusions on the effect of trade than did his neoclassical successors, notwithstanding their deployment of a similar set of tools.

To highlight that such varying interpretations matters, I first show how important the neoclassical partial equilibrium model is in current pedagogy and research. I then trace the early neoclassical use of this model, in order to show that the normative conclusions arrived at by these pioneers still persist today. The rest of the paper attempts to re-evaluate Cournot's trade model, including the reasons for its dismissal by early neoclassical trade theorists. What I attempt to show is that Cournot's trade model is internally consistent, albeit based on extreme assumptions. It is my contention that these assumptions are no more extreme than those invoked by neoclassical practitioners when discussing and estimating the

impact of trade policies. Neither Cournot nor neoclassical practitioners could be accused of logical inconsistency, although both sides could stand accused of lack of realism when it comes to their (primarily latent) assumptions of how markets work. That a given set of tools can lead to very different conclusions is a useful exercise in reminding us that deriving normative conclusions depends on a whole supporting infrastructure of assumptions. In order to arbitrate between competing positions, it is first necessary to know that there are competing analyses. This alone justifies history of thought as an academic exercise. If diverse, logically consistent theories then point to the necessity of empirical mediation in the course of their evaluation, that can only be considered an added bonus.

2. The Use of Partial Equilibrium Models to Evaluate Trade Policy

Partial equilibrium models are a widely deployed tool used to represent both the positive and normative effects of commercial policy, such as the impact of tariffs and quotas on domestic economies. The positive effects are shown as the wedge that such a policy creates between global and domestic prices, and how that price difference affects domestic demand, domestic supply and either exports or imports in particular markets, while the initial normative or welfare effects are represented by changes in producer and consumer surplus. Figure 1 shows the well-known depiction of how a tariff (t) increases the global price P_w to $P_w + t$, resulting in higher domestic supply S_2 and lower domestic demand D_2. The areas A and B are considered to be the combined welfare loss from such a policy, where such loss is said to represent the allocative inefficiency of a tariff. These losses are usually categorised as production distortion losses (A), implying resource misallocation, and consumption distortion losses (B), denoting losses to consumers. In both instances such losses are deemed wasteful, since these are economic impacts that are said to benefit no-one.

Figure 1 is standard fare in all undergraduate international economics textbooks, usually appearing in the chapter dealing with the instruments of trade policy and their welfare effects.[1] But their use is not simply pedagogic, in that the calculation of presumed allocative inefficiency via the estimation of welfare loss triangles (another widely used term) is a commonplace activity of trade economists.[2] And such estimation is not confined to studies of the impact of trade policy on particular markets, it also extends to empirical work that seeks to measure the impact of trade policy on national economies and internationally. For example, the Global Trade Analysis Project (GTAP), which was established in 1992, conducts quantitative analysis of international economic issues in an economy-wide framework.[3] A feature of such applied general equilibrium models like GTAP is that the welfare effects of trade are broken down into Allocative Efficiency (the welfare triangles), Terms of Trade effects and Savings and Investment effects. However, while Terms of Trade and Savings and Investment effects can be positive or negative for a country (and are zero globally), it is a built-in assumption that Allocative Efficiency from trade liberalisation is always positive. This encapsulates the idea that trade is a positive-sum game for all countries who engage in it.

The intent of this section has been to show that, notwithstanding advances in theoretical trade theory and in applied trade analysis, which can allow for additional effects from trade liberalisation, such as the exploitation of economies of scale, or increased

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[1] Chapter 9 of Krugman, Obstfeld and Melitz (2012) and chapter 6 of Husted and Melvin (2009) are two such instances.
[2] See for example the work of Hufbauer and Elliot (1994) on the cost of protection to the US and that of Messerlin (2001) who estimated the equivalent costs for Europe.
[3] See Hertel and Tsigas (1997) for a discussion of the modelling aspects of global trade analysis.

efficiency due to competition, all models still incorporate estimates of the welfare triangles as shown in Figure 1.

Figure 1
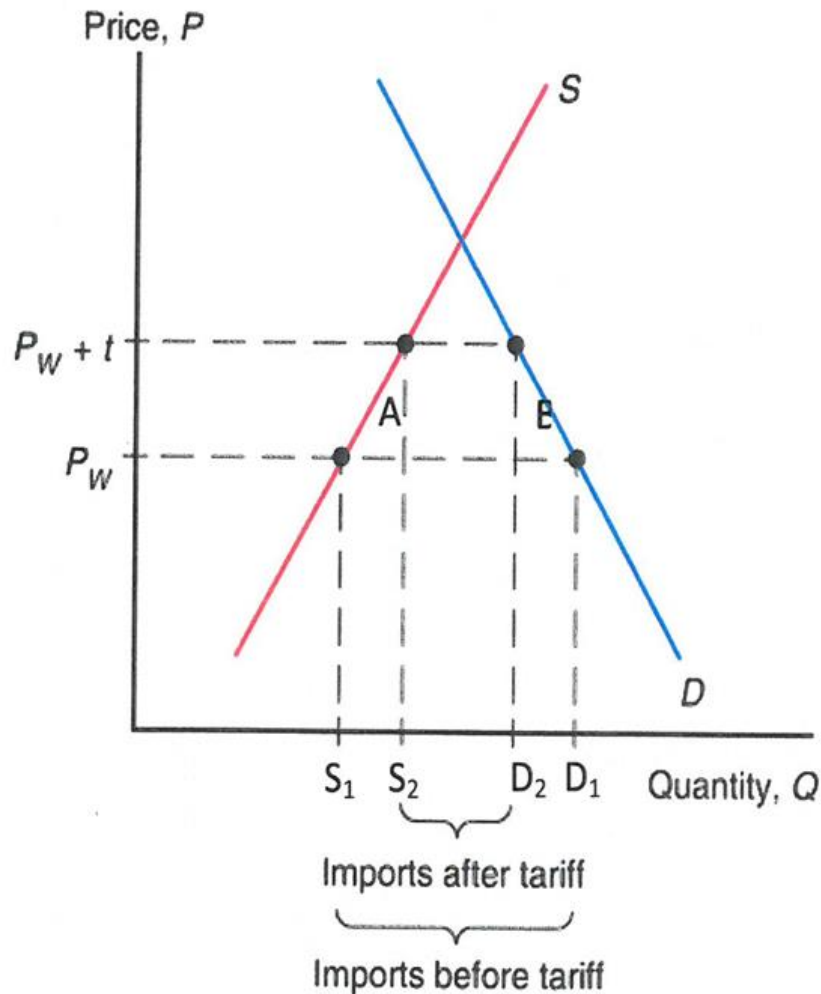
3. Historical Roots for such Analysis: Conventional Story

The partial equilibrium approach to markets is generally attributed to Alfred Marshall, notwithstanding the influence of Augustin Cournot on the former.[4] The distinguishing aspect of Marshall's deployment of partial equilibrium analysis was his derivation of demand from utility and the concept of consumer surplus. Its application to trade is contained in 'Miscellaneous Notes on Economic Theory', printed in *Early Economic Writings* (Whitaker, 1975, pp. 246-248), which shows the gains from trade using consumer and producer surplus to evaluate such gains. Since Marshall's preceding notes were not published during his lifetime, it is difficult to know whether later writers were aware of this analysis when they developed their own trade theories employing Marshallian tools.

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[4] According to Creedy (1990, p. 99), Marshall said that he had read Cournot in 1868, while Vaggi and Groenewegen (2003, p. 228) confirm Cournot's influence with the information that Marshall's first paper on the theory of value, written *circa* 1870, dealt with price determination simply in terms of supply and demand, ignoring utility. This would have been faithful to Cournot's approach to demand, since the latter rejected a uniquely utility-based explanation of demand in favour of an inductive approach, not least because he believed that the determinants of demand were various and incapable of enumeration (Cournot, 1971[1838], p.47).

Marshall's student, Henry Cunynghame, used the Marshallian apparatus to show the effect of import and export duties on prices, and, in the process, presented the famous back-to-back diagram showing the effect of bringing two previously isolated markets, both making and consuming the same good, into contact through trade. Ignoring transport costs and proceeding from the assumption that domestic demand and supply conditions differ in both countries, Cunynghame showed that the country with the lower autarky price would export to the one with the higher autarky price, and that the post-trade price would be intermediate to both country's autarky prices and be determined by combined demand and supply conditions in both markets (see Cunynghame, 1903). Figure 2 is a version of this analysis, though not represented in back-to-back form.

According to Viner (1965[1937], p. 589), while Cunynghame did not draw any conclusions with respect to the gains from trade from his diagrams, Enrico Barone used the same diagram to deduce welfare conclusions. In terms of Figure 2, the free trade price p* ensures that country A's exports of $q^{*s} - q^{*d}$ equals country B's imports of $q^{*d} - q^{*s}$, and country A's gains are represented by the area A, while country B's gains are represented by the area b + c.

Creedy (1990, pp. 100-101) claims that, notwithstanding his earlier notes, Marshall rejected the use of partial equilibrium schedules involving money prices when it came to analysing foreign trade and that this is why he developed his offer curves. However, Creedy also asserts that Marshall's notes on Cournot were an attempt to translate Cournot's chapter 12 (on the effects of trade) into the now familiar triangles (Creedy, 1992, p. 13). It is not clear to me whether Creedy means that Marshall's notes were his graphical representation of Cournot's welfare analysis of the effects of trade, in which case he [Creedy] is incorrect, or whether he means that Marshall's notes represented the *transformation* of Cournot's work using the concepts of consumer and producer surplus, to give it a different normative twist (to that of Cournot). In any case, for the purposes of this paper, the important point is that the normative application of partial equilibrium analysis, as stated by Marshall in his notes, and subsequently by Barone, is what is still used today in economic pedagogy, economic theory and applied research. It also differs from Cournot's normative conclusions, even as the partial equilibrium tools deployed by early neoclassical economists (and which still persist today) owe their origins to Cournot.

4. Originator of the Partial Equilibrium Approach to Trade: Augustin Cournot

Cournot, in Chapter 10 of *Mathematical Principles of the Theory of Wealth,* addresses the effect of the integration of two markets that were previously isolated (Cournot, 1971[1838]). In this chapter, using demand and supply analysis that he had developed earlier in the book, he works out conditions that must be satisfied for equilibrium to exist before trade and after trade under conditions of unlimited competition. Essentially, his analysis is what is represented in Figure 2. The positive account of the effect of market integration on the determination of prices, production and consumption in both markets and the flow of trade is essentially the same in Cournot's mathematical exposition and Cunynghame's diagrammatic one. According to Creedy (1990, p. 100), Cunynghame produced the now familiar back-to-back diagram without any reference to Cournot but virtually paraphrasing the latter's introduction to his model. He added that it is not widely recognised that Cunynghame's treatment stems from Cournot, citing how the major study on the theory of trade by Jacob Viner failed to acknowledge that the diagram represented Cournot's model (Creedy, 1990, p. 100).

Of interest in this paper is Cournot's welfare analysis, or, as he described it 'how commerce between two markets … causes the value of social income to vary … in the importing as well as exporting market' (Cournot, 1971[1838], p. 150). It is here where the apparatus developed by Cournot, but appropriated by others, delivers vastly different conclusions.

Cournot proceeded to look at the impact of trade on the income of producers and consumers. In terms of Figure 2, he concluded that producers in the exporting country A would enjoy an increase in income equal to $p^* q^{*s} - p^a q^a$, while consumers would suffer an income loss equal to $(p^* - p^a) q^{*d}$. In other words the aggregate change in income for the exporting country would be equivalent to the area B+A+D+E, which he concluded was unambiguously higher than it had been before trade.[5] By contrast, for the importing country B, producer income would fall by $p^b q^b - p^* q^{*s}$, while consumers would enjoy an income gain of $(p^b - p^*) q^b$. The net effect would be a fall in aggregate income, equivalent to the area d.[6]

Figure 2

Country A   Country B
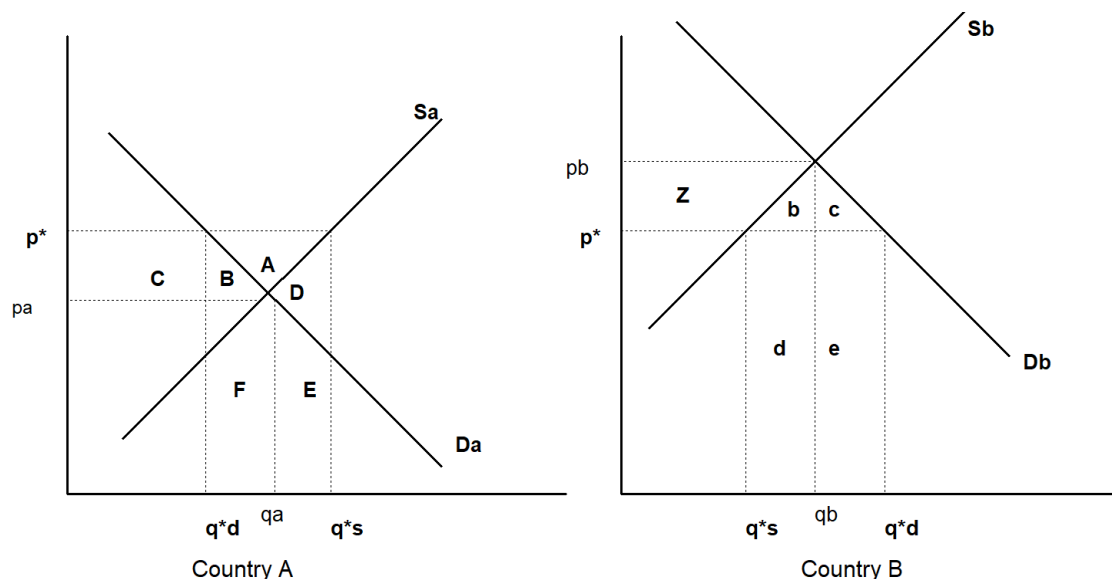
What is striking is how the same apparatus, one that yields the same positive results in terms of equilibrium prices, output, demand and trade flows, when manipulated by Cournot and by his neoclassical successors, gives rise to such different normative conclusions. For neoclassicals, trade is a positive-sum game for both countries, whereas in Cournot's hands, the gain to the exporting country is greater and the importing country loses. So who is correct and how is the impartial observer meant to arbitrate between the two positions? And why has Cournot's interpretation faded from common view?

5. Why the Neglect of Cournot's Trade Analysis?

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[5] Specifically, Cournot expressed the gain to the exporting country as being the nominal value of exports less the fall in domestic consumption valued at pre-trade prices (see equation 4, p. 153). For him, this was 'the actual increase of the national income' (Cournot, 1971[1838], p. 153).
[6] For the importing country, equation 8 (p. 156) expresses the fall in national income as the fall in production valued at free trade prices.

Creedy points out that, despite the acknowledged importance of Cournot for Marshall, there is no mention of him in any of Marshall's published work on foreign trade, a lacuna that Cunygnhame did not remedy (Creedy, 1990, p. 100). Indeed, the general lack of awareness of Cournot's trade analysis is all the more remarkable, when one considers that it is his apparatus that is still in use today in all contemporary textbooks. One possible explanation for his neglect in this area is that his analysis is incorrect. This was the view of Bertil Ohlin, who remarked 'Cournot's work on international trade has attracted little attention, which is no doubt partly to be explained by the fact that his conclusions are on the whole erroneous' (Ohlin, 1935, p. 563).[7] Ohlin admitted that he came late to the work, and, other than the aforementioned dismissal, he did not deign to explain in what way Cournot's trade theory was erroneous. However, accusing Cournot of logical errors is a disquieting position to adopt, given the high esteem in which he was held by succeeding generations of neoclassical economists, especially for his mathematical ability. One way out of the impasse is to accuse him of protectionist sentiment that overrode his analytical judgement. This was the position adopted by Charles Bastable, for whom the only explanation, for why someone of Cournot's analytical power could have derived the conclusions that he did, had to be due to 'bias against the free trade doctrine of Adam Smith and his followers' (Bastable, 1903, p. 175). Irving Fisher took an interesting stance. On the one hand he lauded Cournot's work, calling the book (*Mathematical Principles of the Theory of Wealth*) 'an economic classic' whose reasoning and conclusion had yet to be superseded and he hailed Cournot as the founder of the mathematical school (Fisher, 1898, p. 120). But on the other hand he dismissed Cournot's analysis of the effects of trade. He blamed his erroneous conclusions partly on his 'fallacious conception of income' (p. 121) and also accused him of 'gross carelessness' (p. 129). So, for Fisher, Cournot's attempt to show that 'a protective tariff may, under special circumstances, increase the national income' can be safely dismissed since 'the idea of income is so arbitrary and faulty' (p. 132). He also pointed out in a footnote how 'Cournot falls again into mathematical error'.[8] So Cournot's trade theory has been neglected (in stark contrast to other parts of his work) because he is deemed to have erred, and the reasons given for his uncharacteristic errors are ideological bias, which is said to have blunted his analytical powers, and carelessness, which Fisher paradoxically attributed to Cournot's mathematical facility, which he maintains rendered him lazy when it came to checking results (p. 129).

6. Making Sense of Cournot's Trade Theory

In this section I will re-evaluate Cournot's trade theory. In the course of this re-examination, I will consider some of the substantive criticisms levelled against it, including subsequent clarifications by Cournot. I will also attempt to show how it fits within the overall thesis of his 1838 book, which was not just to theorise about issues in political economy, but to do so in a mathematical way. Key to understanding Cournot's approach is to realise that while he was

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[7] This judgement on Cournot is contained in Appendix II of Ohlin's original edition of *Interregional and International Trade,* where Ohlin discusses some earlier theories of trade. The appendix is not contained in the revised 1967 edition of the book.

[8] To bolster his case that Cournot was careless, Fisher (p. 132, footnote) points to an error that Cournot made when working out the effects on national income of free trade when transport costs exist, and the profits from same accrue to agents in the importing country. Fisher is correct in his accusation. The effect of transportation profits accruing to agents in the importing country is to reduce the losses to the importing country (applying Cournot's model). However, the conclusion that Cournot reaches that such a reduction will turn losses into gains is not logically conclusive, in that it may or may not. However, this error by Cournot does not invalidate his general model on the effect of free trade on the importing country when transport costs are disregarded.

attempting to develop a science of social physics (influenced as he was by the philosophy of Auguste Comte), which justified a mathematical approach to social phenomena, he was nevertheless cognisant that there were questions to which mathematical analysis cannot apply.

One early criticism levelled at Cournot was his use of nominal prices to evaluate changes in income. Bastable (1903, p. 174) raised this point, adding that, since the value of money may vary between countries, this in itself is enough to render his results unsound. Edgeworth (1894, p. 630) dismissed this criticism on the grounds that Cournot's reasoning was as valid as that of Marshall, who used nominal prices when discussing consumer rent. In any case, since this partial equilibrium diagram is used in neoclassical economics to show the normative effects of trade, the appropriateness or otherwise of using money prices as a measure of value is extraneous to explaining how an identical diagram with identical equilibrium outcomes can yield such different normative conclusions in the hands of Cournot and neoclassical theorists and practitioners. This, we shall see, is due to essential differences in how consumer welfare is interpreted and how markets are presumed to function. In the analysis that follows, reference is to the cases of Countries A and B as represented in Figure 2.

Cournot has been accused of inadequately addressing the effect of liberalisation on consumers' income (Viner, 1965[1937], p. 588 and Gomes, 2003, pp. 93-94). This accusation overstates the case. Cournot does recognise the income losses to consumers who stay in the market but who must now pay a higher price in the exporting country (area C for consumers in country A) and the income gains to existing consumers in the importing country (areas Z+ b in country B). What he does not include are the presumed extra consumer income losses (gains) in the exporting (importing) country as a result of consumers exiting (entering) that particular market. This was not an oversight but a conscious decision that he acknowledges: '… we have not considered the loss experienced by that class of home consumers who stop buying the dearer commodity [in the exporting country], and who must make a use less to their liking of a part of their incomes' (Cournot, 1971[1838], p. 154). Similarly, in the importing country 'We do not consider … the advantages resulting to consumers … of the reduction … to use a part of their incomes more to their liking' (p. 156). His justification in both instances was that such consumer losses or gains were 'not capable of measurement, and do not directly affect the national wealth in the commercial and mathematical sense of the term' (p. 154). This shortcoming in his analysis, if such it be, can be attributed to his theory of wealth and the scope of his method. For Cournot, wealth is 'value in exchange' and, as such, 'susceptible of rigorous treatment' (p. 10), by which he means mathematical analysis. By contrast, 'utility [is something] which everyone estimates in his own way, because there is no fixed standard for the utility of things' (p. 11). Cournot does not deny that objects have utility, but simply argues that a concept like utility is too variable and indeterminate, and as such not suited as the foundation of a scientific theory (p. 10).[9]

The other major criticism of Cournot's analysis is his treatment of production and the impact of international trade on same. In the exporting country, producer income is held to increase by C+B+A+D+E. The inclusion of D+E as a gain to national income presupposes

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[9] Cournot, who was the first economist to define and draw a demand curve, did so without invoking utility. For Cournot, observation was the basis for his conclusion that 'the cheaper the article is, the greater ordinarily is the demand for it' (p. 46). He acknowledged that demand for a good was determined by, *inter alia*, its utility, services rendered, enjoyment, habits of people, average wealth, distribution of wealth, but did not believe that these 'moral causes' were capable of measurement, and, as such, they were not the basis for his conclusion that demand is generally inversely related to price (p. 47). He even went so far as to acknowledge that there were species of goods where demand was positively related to price, but these were excluded from his analysis of the social economy on the ground of their empirical rarity (p. 46).

that the resources now employed in increased (real) production in this sector were previously idle. Similarly, his analysis of the impact of international trade on the importing country, whereby producer income is held to fall by Z+b+d and d is treated as a net loss to the country (since there is no commensurate offsetting consumer gain) implicitly assumes that the real resources released from the contracting import competing sector fail to find employment elsewhere in the economy.

One reading of this result is that it assumes that resources are immobile between sectors. This was the interpretation of early critics, such as Hagen, who rejected Cournot's conclusions on the grounds that the assumption of resource immobility was unwarranted. Viner refers to this explanation, but adds that Cournot himself denied in subsequent writings that he was assuming resource immobility (see Viner, 1965[1937], p. 587, footnote 7). Indeed, Angell did assert that Cournot starts with the fundamental idea that the mobility of productive resources in a given country is relatively slight, so that, if an industry contracts due to imports, the wealth tied up in it is in large part lost. He also noted how this assumption was in direct contradiction to the perfect internal mobility assumed by classical economists, but said that it was latent throughout Cournot's analysis, thus [for him] explaining the failure of his critics to do him justice (Angell, 1926, p. 243). Like Viner, Theocharis also alleges that Cournot rejected the resource immobility claim, referring by way of evidence to Cournot's response to Hagen in his subsequent book *Principes,* where he says that he had taken account of this through his principle of 'compensation of demands' (Theocharis, 1983[1961], p. 196).

My understanding of what Cournot said in *Mathematical Principles of the Theory of Wealth*, is that employment of resources in other sectors of the economy does not change, *not* because of resource immobility, but rather because overall demand for their products remains unchanged. On page 166, Cournot raised the issue of whether resources employed in a sector find other employment, claiming that he had earlier replied to this objection (referring the reader to the earlier explanation) and, by giving an example designed to show the difference between his principles and those of the Adam Smith school, whom he believed to be in error. In the earlier explanation he dismissed this 'specious objection [of presumed immobility of resources]' (p. 146) and instead asserted that what matters is whether 'funds withdrawn from commodity A, to the demand for commodities B, C etc. [are] implicitly considered [in the estimation of the average result] … [the] neglect of which would have given rise to the objection we are endeavouring to refute' (Cournot, 1971[1848], p. 148). In his subsequent example designed to show the difference between his thought and that of the Smith school, he stresses (albeit clumsily) that factor mobility is not the issue: 'this circumstance that for certain agents and producers, other employments … may be substituted … -this circumstance, we say, really has nothing to do with the question' (p. 169). Instead the issue is that if a country diverts expenditure to imports it 'dispossesses itself … of the value' (p. 169) and 'This value stops providing the income of certain French workers and producers' (p. 169).

This interpretation (lack of demand) of why resources released from the import-competing sector fail to find alternative employment fits in with Cournot's discussion of Balance of Payments. While he explicitly says that what he is analysing is the effect of the removal of barriers for a particular commodity – 'What will be the effect of this removal of barriers which affects only a single commodity' (p. 162) – he goes on to say that a quantity of a commodity cannot pass from A to B without having an equal value imported directly or in some roundabout way from B to A. But he is insistent that he has accounted for this by 'the reduction in the total fund which home consumers could apply to the collective demand for commodities … other than [the imported commodity]' (p. 163). In terms of Figure 2, this amounts to saying that, for country B, imports of d+e in the particular market under

investigation must be matched by exports of the same value elsewhere in the economy. This will be the case if output remains unchanged in other sectors but domestic demand for other goods falls by d+e (due to a fall in production d and switch in domestic consumption e), to be replaced by export demand. A similar reasoning can be applied to country A. It would also explain why, notwithstanding balanced trade, Cournot insists that the 2 countries are 'not placed under symmetrical conditions' (p. 163).

The objective of the latter exegesis is not to say that all the assumptions that Cournot made were justifiable or sufficient, but rather to point out that his analysis did have an internal logic. Essentially, I am making the same point as Angell, for whom 'the analysis [was] substantially valid' (Angell, 1926, p. 245), even if my explanation as to why resources do not find alternative employment is different. I would go further and tentatively contend that Cournot's analysis could even be seen as an imperfect precursor to Keynes, to the extent that he is assuming that employment of resources is a function of output and output a function of demand. To support this claim, I would add that Cournot essentially parodies the theoretical analysis of Jean Baptiste Say, whom he accuses of making gratuitous suppositions concerning the employment of home producers (Cournot, 1971[1838], p. 169). This could be interpreted as a refutation of the notion that markets have an inbuilt tendency to full employment. It would also explain why, in the case of country A represented in Figure 2, the increase in output D+E is seen to add to national income, which could only be the case if output increased without drawing resources from other sectors. This would be a reasonable conclusion for one who accepted (as arguably Cournot did) that unemployment can be a persistent and stable feature of economies. Interestingly, Theocharis, uses Cournot's response to Hagen's observation that an increase in production can only come about at the expense of other branches, where he acknowledges that 'there may be circumstances where an industry will not be able to develop except at the expense of another' (cited in Theocharis, 1983[1961], p. 196) as a concession on the part of Cournot. To me, this is not a ringing endorsement of the inevitability of full employment, merely a recognition that there may be circumstances where different sectors compete for scarce resources, not that this is invariably the case.

His treatment of balance of payments is also worthy of note insofar as he appears to be saying that while trade must be balanced, such balance does not require full employment, or indeed say anything about the constraints that production places on the balance of payments. A country's trade could be balanced with increased production or with reduced production, as long as domestic consumption adjusts accordingly.

As to the general charge that Cournot's partial equilibrium approach to analysing the effect of trade is inadequate and that a general equilibrium approach is necessary, it is necessary to recall Cournot's justification for the deployment of mathematics and the representation of social phenomena in functional form. Cournot explicitly acknowledged that in deploying his partial equilibrium apparatus, he was treating 'as given and invariable the prices of other commodities and the incomes of other producers' (Cournot, 1971[1838], p. 127) and that this is at variance with the reality of market interdependence. However, he defended his approach and his failure to take the 'entire system into consideration' on the grounds that 'it would surpass the power of mathematical analysis and of our practical method of calculation' (p. 127). He was applying mathematical method to the parts of theory that he believed were susceptible to such treatment. He had in his introductory chapter asserted that theorising in political economy had failed to make progress either because 'the relations which it had to deal with are not reducible to fixed terms, or because the relations are much too complicated for our powers of combination and analysis' (p. 16). It is difficult not to

conclude that there was something rather prescient in this judgement, given the ubiquity of mathematical theorising in economics today, often yielding results of questionable value.

7. Making Sense of Neoclassical Trade Theory

As mentioned in earlier sections, contemporary neoclassical theory, when applying partial equilibrium tools to issues of trade, concludes that, in particular markets, the gains from liberalisation include, *inter alia*, the welfare triangles that are supposed to address consumption and production efficiency (areas A+B, in Figure 1 or A for country A and b+c for country B, in Figure 2). As we saw, Cournot ignored consumer surplus associated with increased or decreased demand in a market as he thought that it was incapable of measurement. By contrast, neoclassical theory holds that those who enter (exit) a market increase (decrease) their overall utility by the amount of their consumer surplus in that particular market. This would only be true if such expenditure when put to other uses reaps zero consumer surplus. Or, to put in another way, it is only accurate, according to neoclassical theory, if the demand curve is the compensated demand curve; that is to say, it is demand for a good holding utility constant (reflecting only the substitution effect of a price change). Given that estimated demand curves are at best approximations of uncompensated demand (with the income effect of price changes included), it can be safely asserted that area c in Figure 2 (for country B) should be considered as an upper bound of the change in consumer surplus for normal goods (those with a positive income effect). Staying with the example represented in Figure 2, the area b is designated as production efficiency that accrues to the importing country. This is because, according to neoclassical theory, the area under the industry supply curve represents not just total cost of production but total value added foregone elsewhere in the economy as a result of employing resources in that particular sector. The assumptions underpinning this interpretation are price-taking behaviour, market prices that approximate to social opportunity cost and constant employment. So, when output contracts in the import-competing sector (Country B, Figure 2), the value of output lost in that sector is judged to be d, but the output created elsewhere when resources get redeployed is deemed to be b+d. This results in a net production gain of b from the more efficient use of resources induced by international competition

8. Reconciling Cournot's Theory and Neoclassical Theory with Market Realities

Both Cournot's analysis and contemporary neoclassical use of Cournot's tools could be best regarded as limiting cases. Using 21st-century language, Cournot's depiction of production presupposes that the opportunity cost of an activity is zero, whereas the neoclassical depiction presupposes that all resources get paid their opportunity cost. A more realistic position would be to recognise that resources may have alternative uses, but that there is no *a priori* reason to assume that in their alternative use they would earn as much as in their current occupation, if employed at all. Indeed, it may be that the alternative to current employment is unemployment. In other words, a more realistic position would be to recognise that markets are imperfect and full employment is at best a desirable objective of economic policy, not a presumed outcome of the operation of unfettered markets. In a similar vein, new consumers attracted to a market by lower prices can be assumed to be enjoying increased net utility, certainly more than zero (as Cournot presumed for pragmatic reasons), but it is unlikely to be as large as neoclassical estimates of c (country B in Figure 2), when for

essentially equally pragmatic reasons, uncompensated demand curves are used to estimate changes in consumer surplus.[10]

So, when applying partial equilibrium tools to the real world, and treating Cournot's welfare analysis and neoclassical welfare analysis as limiting cases, we can see that there can be no presumption as to whether a country gains or not from trade. When looking at import markets, the net effect is intermediate between -d (resources find no alternative employment and no net consumer gains) and b+c (perfect markets pricing resources at their opportunity cost and negligible difference between uncompensated and compensated demand). So *a priori* we cannot say if the net effect is positive or negative. When looking at export markets, the conclusions are more benign, with net effects presumed positive in both analyses but probably intermediate to A (the neoclassical position) and BADE (Cournot). Given the complexity of the issue, it may be difficult to marshal definitive evidence for either the Cournot or neoclassical perspectives, but we can make reasonable evaluations as to which framework is most suitable in different contexts. So, for example, if the income effect of a change in the price of a good is large, and if factor markets in an economy are characterized by rigidities, unemployment and differential remuneration for similar work, then it is reasonable to favour a Cournot framework, especially in the short run. The converse of low income effects and well-functioning factor markets would be more supportive of a neoclassical framework. What needs to be interrogated is the uncritical implicit adoption of a particular perspective both theoretically and, even more insidiously, when engaging in empirical or applied analysis (GTAP being a case in point).

9. What Can we Learn from the Neglect of Cournot in the Domain of Trade?

What this paper sought to do was to rehabilitate Cournot's trade theory on the grounds of its internal consistency. While acknowledging that his conclusions can only be justified on the basis of strong, indeed extreme assumptions, I would assert that these assumptions are no more extreme than those invoked by neoclassical trade theorists when making the case for trade liberalisation. Furthermore, neoclassical assumptions go further, in that they impart a positive bias to measurements of the effects of trade (the inbuilt assumption that the welfare triangles must represent unambiguous gains to countries).

The neglect of Cournot's trade theory cannot be attributed to its erroneous conclusions. Rather, it would not be too outlandish to suggest that its initial rejection by neoclassical economists was due to its uncomfortable implications for trade theory. Neoclassical theory has, by and large, been supportive of free trade. Alfred Marshall, whose influence cast such a long shadow over Cambridge, is alleged to have said that the man who refuses to support free trade could not be a *bona fide* professional economist (Coats, 1972, p. 488). During the tariff reform crisis of 1903, he lent his name and considerable authority to the free trade case, a measure designed not only to impact on a particular political problem but also to underline the specialised expertise of the economist when it came to economic issues. Keynes, at his own admission, was an ardent free trader in his youth and early middle age, as evidenced by this comment in the *Guardian* in 1923, 'We must hold to Free Trade in its widest interpretation as an inflexible dogma, to which no exception is admitted, whenever the decision rests with us' (Keynes, 1923, p. 717). All of this serves as a warning not to dismiss the impact of ideological bias on theory, especially in the social sciences. That these biases

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[10] Of course Cournot also did not consider this change in consumer surplus to be a change in wealth as he defined it, that is to say, value in exchange. His rejection of utility as a basis for welfare judgements was that for him it was incapable of proof and therefore, not scientific.

are not often recognised by later practitioners can, in part, be explained by lack of historical awareness.

That Cournot's tools are still employed today (without attribution) reveals a certain opportunism in how neoclassical theory evolved. The desirable aspects of Cournot's tools were their mathematical expression, which sufficed to convince many neoclassical practitioners that their analysis was rigorous. The irony is that Cournot, while anxious to be rigorous and scientific, was also aware of the limited application of mathematical theorising in the social domain. That would explain the self-imposed limits in terms of the questions he addressed, and the extent to which he also allowed his theoretical speculations to be guided by what he deemed to be common sense.[11]

In showing that both Cournot and neoclassical practitioners are internally consistent in their use of the same set of tools, I desire to highlight that theoretical rigour is not sufficient to ensure the relevance of a theory, especially one with policy implications. Empirical arbitration is necessary to adjudicate between competing theories.

Finally, this exercise has shown the benefits of knowing the historical evolution of thought, especially in the social sciences. For students to be able to arbitrate between different theoretical stances, especially in instances such as the one discussed in this paper where both sides use the same tools, it is first necessary to be aware that there is indeed more than one position. Such awareness can only lead to increased epistemological sensitivity as to how one establishes which theory gives a better representation of the causal forces at work in society.

Acknowledgements

References

Angell, J. (1926) *The Theory of International Prices: History, Criticism and Restatement.* Cambridge, MA: Harvard University Press.

Bastable, C. (1903) *The Theory of International Trade with some of its Applications to Economic Policy.* 4th edition, London: Macmillan.

Coats, A.W. (1972) 'The appointment of Pigou as Marshall's successor: comment.' *Journal of Law and Economics,* 15 (2), pp. 487-495

Cournot, A. (1971[1838]). *Researches into the Mathematical Principles of the Theory of Wealth.* New York: Augustus Kelley (Reprints of Economic Classics).

Creedy, J. (1990) 'Marshall and international trade.' In: Whitaker, J.K. (ed). *Centenary Essays on Alfred Marshall.* Cambridge: Cambridge University Press.

Creedy, J. (1992) 'Cournot on trade between regions and the transition from partial to general equilibrium modelling.' *History of Economics Review,* 18, pp. 10-19.

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[11] Paralleling the neglect of Cournot's trade analysis has been the neglect of his vision of markets (and the primacy that he gave to rational producer action), as well as his conception of national income, in the subsequent development of general equilibrium analysis. Contrary to the view of Fisher (1898, p. 121), for whom Cournot's last two chapters were only of historical interest, I believe that Cournot's views on social income would also repay further analysis. But that is beyond the remit of this paper.

Cunynghame, H. (1903) 'The effect of export and import duties on price and production examined by the graphic method.' *Economic Journal,* 13 (51), pp. 313-323.

Edgeworth, F. (1894) 'Theory of international values.' *Economic Journal*, 4 (16), pp. 606-638.

Fisher, I. (1898) 'Cournot and mathematical economics.' *Quarterly Journal of Economics,* 12 (2), pp. 119-138.

Gomes, L. (2003) *The Economics and Ideology of Free Trade: An Historical Review.* Cheltenham: Edward Elgar.

Hertel, T. and Tsigas, M. (1997) 'Structure of GTAP.' In: Hertel, T. (ed). *Global Trade Analysis: Modelling and Application.* Cambridge: Cambridge University Press.

Hufbauer, G. and Elliot, K. (1994) *Measuring the Costs of Protection in the United States.* Washington, D.C.: Institute for International Economics.

Husted, S and Melvin, M (2009) *International Economics,* International edition of 8th revised edition. London: Addison-Wesley.

Keynes, J.M. (1923) 'The underlying principles.' *Manchester Guardian Commercial Supplement*, pp. 717-718.

Krugman, P., Obstfeld, M. and Melitz, M. (2012) *International Economics: Theory and Policy.* 9th edition, Harlow: Pearson.

Messerlin, P. (2001) *Measuring the Costs of Protection in Europe: European Commercial Policy in the 2000s.* Washington, D.C.: Institute for International Economics.

Ohlin, B. (1935) *Interregional and International Trade.* Cambridge MA: Harvard University Press.

Ohlin, B. (1967) *Interregional and International Trade,* (revised edition). London: Oxford University Press.

Theocharis, R. D. (1983[1961]) *Early Developments in Mathematical Economics,* 2nd edition. London and Basingstoke: Macmillan.

Vaggi, G. and Groenewegen, P. (2003) *A Concise History of Economic Thought: From Mercantalism to Monetarism*. London: Palgrave Macmillan.

Viner, J. (1965[1937]) *Studies in the Theory of International Trade.* London: Allen and Unwin.

Whitaker, J. ed. (1975) *The Early Writings of Alfred Marshall, 1867-1890, Volume 2,* London and Basingstoke: Macmillan.

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A Quantum Theory of Money and Value, Part 2: The Uncertainty Principle

David Orrell, Systems Forecasting, Toronto, Canada
dorrell@systemsforecasting.com

Abstract

Economic forecasting is famously unreliable. While this problem has traditionally been blamed on theories such as the efficient market hypothesis or even the butterfly effect, an alternative explanation is the role of money – something which is typically downplayed or excluded altogether from economic models. Instead, models tend to treat the economy as a kind of barter system in which money's only role is as an inert medium of exchange. Prices are assumed to almost perfectly reflect the 'intrinsic value' of an asset. This paper argues, however, that money is better seen as an inherently dualistic phenomenon, which merges precise number with the fuzzy concept of value. Prices are not the optimal result of a mechanical, Newtonian process, but are an emergent property of the money system. And just as quantum physics has its uncertainty principle, so the economy is an uncertain process which can only be approximated by mathematical models. Acknowledging the dynamic and paradoxical qualities of money changes our ontological framework for economic modelling, and for making decisions under uncertainty. Applications to areas of risk analysis, forecasting and modelling are discussed, and it is proposed that a greater appreciation of the fundamental causes of uncertainty will help to make the economy a less uncertain place.

1. Introduction

The profession of economic forecasting has come under widespread criticism in recent years, particularly for its inability to foresee major crises, such as the one from which the world economy is still struggling to extricate itself. As Adair Turner (2014) noted, 'Modern macroeconomics and finance theory failed to provide us with any forewarning of the 2008 financial crisis.' That was the case even *during* the crisis of 2008 (Ahir and Loungani, 2014): a study that year by IMF economists showed the consensus of forecasters was that not one of 77 countries considered would be in recession the next year (49 of them were). Central bankers, who were heavily influenced by mainstream economic theory, were caught equally unawares (White, 2013).

This problem has often been blamed on theories such as the efficient market hypothesis, which states that market fluctuations are random and therefore cannot be predicted (Fama, 1965; Lucas, 2009), or even the butterfly effect from chaos theory

(Ormerod, 2000; Bernanke, 2009). However neither efficiency nor butterflies is the first thing that comes to mind when contemplating what became known as the Great Financial Crisis.[1]

A more reasonable explanation for the failure of standard economic models, as pointed out by a number of economists, is that they do not properly take into account money, debt, or the massive financial sector (White, 2013; Keen, 2015). Instead, they treat the economy as a kind of barter exchange system, in which money plays little role except as an inert medium of exchange, and a metric of economic activity. Many of the key results of economics, such as the Arrow-Debreu (1954) theory of general equilibrium, rely on models which exclude money altogether; and, as discussed below, even the modern dynamic stochastic general equilibrium models, used to predict the effect of policy changes, do not usually include a financial sector.

In particular, risk models that are designed to assess uncertainty treat the economy as an essentially static system, unaffected by the dynamics of money. This omission is particularly glaring given the fact that the financial sector dominates the economic power structure, produces most of the money through credit creation, and was at the heart of both the 2008 crisis, and its aftershocks – for example in the eurozone crisis.

This paper will argue that the catastrophic misunderstanding of risk, which paved the way for the financial crisis, is driven by our failure to properly account for the properties of money. Bringing money back into the picture does far more, though, than tweak the way we model the financial sector; it alters our most basic understanding of how the economy works, and therefore upends our ontological framework of commonly accepted (and often unspoken) assumptions and working practices for things like risk, forecasting and decision making under uncertainty. This affects even areas that seem far removed from finance.

The paper begins by looking at traditional theories of money, and shows that the Newtonian, mechanistic approach favoured by mainstream economics leads to the view that money has little importance. We then recap, from a preceding paper, an alternative perspective on money and value, inspired by non-Newtonian physics, which argues that money is an intrinsically dualistic phenomenon which binds precise number with the fuzzy concept of value. Money gains its power by forging this link, but the result frequently shows paradoxical behaviour. We show how these properties of money feed into the behaviour of the economy as a whole. The link between price and value is unstable, and this drives much of the uncertainty in the economy. The paper discusses implications for risk assessment, forecasting applications, economic modelling and decision-making under uncertainty; and concludes by arguing that a better understanding of the nature of money is a necessary first step to understanding the causes of uncertainty in economic forecasting.

2. The Role of Money

Since probably the time of its invention, a debate has raged over whether the value of money is intrinsic (a measure of inherent value), extrinsic (something assigned by the state), or a mix of the two (see, e.g., Kiyotaki and Wright, 1989). Bullionists, for example, argue that money needs to be based on a weight of precious metal, which gives it intrinsic value; while chartalists emphasise the role of the government, which backs the value of its money by accepting it for payments such as taxes (Knapp, 1924, pp. 38-39). Most mainstream economists, meanwhile, take a neutral position, which says that money has no unique or special qualities, but instead is defined by its roles, e.g. as a medium of exchange, a store of

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[1] Sensitivity to initial conditions (the 'butterfly effect') is certainly a factor in nonlinear models, but a more relevant cause of forecast error is usually drawbacks in the model itself (Orrell, 2012, pp. 205-208).

value, and a unit of account (Jevons, 1875). In particular economists tend to emphasise the first: Samuelson and Nordhaus (2001, p. 511), for example, defined money as '*anything that serves as a commonly accepted medium of exchange*' (their italics). One consequence of this approach is that economic questions are reduced to abstract calculations of utility, which is assumed to be directly related to price. As we'll see, this has shaped our approach to economic modelling and decision making.

An alternative approach to the subject of money, described previously (Orrell, 2016; Orrell and Chlupatý, 2016; Orrell, 2017), is to begin with the concept of number, and its relation to the world of things. To summarise, we first define money objects to be transferable entities, created by a trusted authority, which have the special property of a *defined monetary value* – specified by a number and a currency unit. They can be a coin, a sheet of paper, or a piece of electronic information sent over a phone (as in quantum physics, with its virtual particles, the distinction between real and virtual objects is blurred). Money is treated as a fundamental quantity, and its unit specifies the currency framework, which involves political and legal factors such as the range of acceptance and other rules. The trade of money objects for goods or labour in a market means that those things also attain a numerical value (in the money's units), namely the price, in a sort of measurement process. In this 'quantum' view, market prices are therefore an *emergent property* of the system, in the sense that they emerge from the use of money objects.

Note this is not to say that money *itself* is best seen as an emergent property. Indeed, a distinguishing feature of any form of money seems to be that it is very carefully designed. Money originated in ancient Mesopotamia as a credit system in a highly-centralised urban society run by temples; coin money in ancient Greece was initially used by the army as a payment system and a means for obtaining supplies. One might argue whether cybercurrencies, such as Bitcoin, are a particularly good or stable form of money, but a great deal of effort was certainly spent in designing them in such a way that they might serve as money. Indeed, the quantum theory of money was in part motivated by the need to describe such cybercurrencies, where the 'trusted authority' backing the currency is the computer algorithm, combined with continuous network surveillance, rather than the state (Orrell, 2016). The function of money is also dependent on the exact design of legal and financial institutions, such as the banking network.

While such a definition – money objects are things with a fixed monetary value – may appear obvious to the point of truism, the objects thus described have some remarkable properties which feed into the economy as a whole. In particular, money objects have both a physical aspect and a virtual aspect which is expressed through interactions, in the same way that a subatomic object like an electron or photon has a dual wave/particle nature. The dualistic, two-sided nature of money means that it frequently shows paradoxical behaviour.

The dual properties of money also resonate with human psychology and make it a strongly psychoactive substance which elicits powerful responses. On the one hand, the fact that money involves ownership makes it an effective emotional and motivational tool; but on the other hand, the fact that it is based on number encourages analytical thinking and the tendency to reduce complex social exchanges to a one-dimensional computation. It is not surprising then that money has conflicting effects, or that our response to it is far from being purely mechanical, rational, or predictable, as behavioural economists (and, for that matter, most humans) have long noted. The idea of rational economic man, central to the utility maximisation assumed in orthodox models, seems anachronistic when money is involved, which is one reason money has been excluded from models.

Another effect of money and debt is to act as a sort of entanglement device. One of the more puzzling aspects of quantum physics is that particles can become linked so that a

measurement of one instantaneously affects the behaviour of the other, even if it is on the other side of the universe. A similar (if less mysterious) phenomenon occurs in the economy, where the creation of money entangles the user of the currency with the issuer, so, for example, users of the euro currency are affected by events in the eurozone. Most money today is created by private banks through issuing loans, which entangle the debtor and creditor so that a change in the status of one (such as bankruptcy) instantaneously affects the status of the other. Financial instruments, such as derivatives, create a complex web of entanglements which sits above the financial system.

Of course, the comparison of economics with physics should not be taken too far, and our aim here is by no means to further mathematicise the subject, or produce a quantum mechanics of the economy – but at least if we are going to draw on physics, as economists routinely do, we should draw on the right kind of physics. Economics is steeped in scientific metaphors whose roots are in Newtonian or Victorian science. The idea of 'utility' for example was envisaged by its Victorian founders as a sort of pleasure energy, rather like heat, but without the meaningful physical units (Edgeworth, 1881). This equation of utility and energy turned economics into a kind of mechanical optimisation problem – what Jevons called a 'mechanics of self-interest and utility' (Jevons, 1957, pp. xvii–xviii) – with prices serving as a relative measure of utility, and therefore value. Today, economic models work in terms of relative prices, but are understood to be optimising utility.

This assumption, that market prices and value are effectively the same thing, is equivalent to collapsing the two aspects of money to a single point. Money objects therefore have no special properties, they just happen to be convenient for exchange. But this Newtonian, mechanistic approach fails in economics in much the same way that it breaks down in physics. Particles are not just self-contained billiard-ball-like objects, and neither is money; both embody dual properties which need to be taken into account. And rather than being based on a deterministic map, the link between price and a meaningful measure of value – like perceived utility – is loose and unstable. This has implications for how we analyse economic uncertainty and make predictions.

3. Risk Analysis and Forecasting

A cherished goal of mainstream economics has long been to link microeconomics and macroeconomics, the individual and the economy as a whole, and include them in a single mechanistic model, thus allowing us to predict the economy the same way we predict a physical system. This reductionist approach also underlies risk analysis and forecasting models. The role of money has traditionally been excluded, because it is assumed that prices reflect rational calculations of utility. However, if prices are seen as emerging out of the complex, fluid interactions of the money system, the reductionist approach makes as much sense as an engineer trying to use atomic physics to compute the turbulent flow of water.

Consider, for example, the standard techniques used to assess risk in financial markets, such as Value at Risk (VaR). These methods were inspired by Eugene Fama's efficient market hypothesis, which assumed that 'in an efficient market at any point in time the actual price of a security will be a good estimate of its intrinsic value' (Fama, 1965, p. 4). While, 'in an uncertain world the intrinsic value of a security can never be determined exactly ... the actions of the many competing participants should cause the actual price of a security to wander randomly about its intrinsic value' (Fama, 1991). It was later noted, for example, that due to the 'joint-hypothesis problem' one can't actually test the intrinsic value without making further hypotheses about future returns, which are also affected by things like

the discount rate (Cochrane, 2011), but these details didn't change the central message that the current price was the best estimate of intrinsic value.

In risk models price changes are, therefore, treated as random perturbations to this assumed steady state, and are modelled by statistical techniques, such as the normal distribution. The standard deviation of the price is found by setting it equal to the standard deviation of price changes over a certain recent period (typically a few months or years). The risk of the price changing by a certain amount is then easily computed. Unfortunately, the method is not very reliable. In 2007, as just one example, the CFO of Goldman Sachs complained that they were seeing what amounted to 25-standard-deviation moves, not once but several days in a row, which has a probability of approximately zero (Tett and Gangahar, 2007).

If we treat prices, not as an accurate measure of 'intrinsic value' or utility, but as an emergent phenomenon, which imperfectly reflects a societal idea of value, then it no longer makes sense to assume that prices are at equilibrium, or that price changes follow a normal distribution, or that future volatility can be reliably approximated from past volatility. If we treat money as a psychoactive quantity, it is not appropriate to treat the market as made up of rational investors whose collective actions somehow drive prices to their 'correct' level. And if we acknowledge the entangled nature of the credit system, it no longer makes sense to view investors as independent. Instead, the quantum uncertainty at the heart of money feeds directly into the economy. In place of a 'mechanics of self-interest and utility' we have something much more subtle, shifting and elusive.

An asset's price is affected by many things including investor psychology, or changes in credit availability, and sentiment, too, can change in an instant – regardless of past performance. The 'bounded rationality' described in behavioural economics doesn't quite capture the extreme swings in opinion which characterise financial crises. Taking this uncertainty into account shows that it is unsafe to assign near-zero probabilities to extreme events, or assume that risk can be hedged away based on mathematical modelling of different assets. (Traders of course know this better than most modellers, but financial incentives mean that they often prefer to use models that underestimate risk when there are profits to be made – see Wilmott and Orrell, 2017.) Model assumptions quickly become invalid, as everyone tries to exit their positions at the same time, and price movements become highly correlated.

The field of quantum finance also takes a quantum approach, in that it models assets such as stocks as having a value that is fundamentally indeterminate, and uses the quantum formalism to come up with its own versions of formulae, such as the Black-Scholes equation, for pricing options (Haven and Khrennikov, 2013). A key difference is that, while these models are usually based on those from mainstream economics – Baaquie (2000, p. 1) wrote, for example, that 'No attempt is made to apply quantum theory in re-working the fundamental principles of finance' – the aim of this paper is exactly to argue that those principles are not valid, because of the nature of money (which, as in other areas of economics, is not discussed much in finance). However, quantum money and quantum finance share the basic insight that prices are best seen as indeterminate, with their values only revealed during transactions, rather than simply as random variables.

4. Macroeconomic Models

As another example of the reductionist approach to economic modelling, policy makers continue to rely on so-called dynamic stochastic general equilibrium (DSGE) models in order

to assess how a change in government policy, such as a trade agreement, will affect the economy. As the Bank of England's Andrew Haldane observes, these models typically incorporate an equilibrium which is 'unique, stationary and efficient,' a view of the economy which is 'ordered and rational,' and result in dynamics which are 'classically Newtonian, resembling the damped harmonic motion of Newton's pendulum' (Haldane, 2014, p. 3). Unfortunately, this elegance comes at the expense of realism. In particular, as William White (2013, p. 13) points out, 'An important practical aspect of [DSGE] models is that they make no reference to money or credit, and they have no financial sector'. The model used by the Bank of England to simulate the economy before the recent banking crisis, for example, had the singular disadvantage of not including banks. In fact, as White observes, 'such crises were literally ruled out in DSGE models by the assumption of self-stabilisation'. The result, according to Haldane (p. 4), is that DSGE models 'have failed to make sense of the sorts of extreme macro-economic events, such as crises, recessions and depressions, which matter most to society'.

Some DSGE models do make steps towards including a financial sector. An early attempt was the 'financial accelerator' of Bernanke, Gertler and Gilchrist (1996), which accounted for the fact that borrowing costs are inversely related to the borrower's net worth. However, while this addressed changes in credit *allocation*, it did not address the issue of credit *creation* by banks, i.e. the new money produced by making loans. A number of more recent models do include this aspect, but here the greatest challenge is that 'banks that create purchasing power can technically do so *instantaneously* and *discontinuously*, because the process does not involve physical goods, but rather the creation of money through the simultaneous expansion of both sides of banks' balance sheets' (Jakab and Kumhof, 2015, p. ii.). As discussed further below, this does not fit easily with the core idea of DSGE models, which is that economic variables are continuous and self-stabilising.

Clearly we cannot understand economic uncertainty unless we first acknowledge the role of money and the financial sector; but a deeper problem is the picture of the economy as a utility-maximising machine which, in turn, is based on ideas about money. If we remove the foundational assumption that monetary values measure (in a proportional sense) the energy-like quantity of utility, and see them instead as numbers that are subject to a variety of nonlinear and discontinuous forces, then these complicated attempts to optimise the economy come apart rather quickly.

These shortcomings of conventional models are particularly important in a world economy which is increasingly dominated by debt. According to mainstream economics, as summarised by Ben Bernanke (1995, p. 17), the debt cycle 'represent[s] no more than a redistribution from one group (debtors) to another (creditors)'. In this linear view of the economy, debts and credits cancel each other out in the aggregate, just as the two sides of money are assumed to merge into a neutral chip. However, this again ignores the pivotal role of private banks, who act as a kind of amplifier on the system, by accelerating money creation when times are good, and decelerating it when times are bad. It also ignores the entangling effects of money and debt. While debts may cancel out in a numerical sense, the power relationships they embody do not, and nor does their vulnerability to sudden and discontinuous change. These aspects were dramatically demonstrated during the crisis when some massive firms at the center of the financial network, such as AIG, had to be bailed out by the government. The nominal value of all derivatives in existence has been estimated at over a quadrillion dollars; it is unlikely that this will simply aggregate out in the next crisis (Wilmott and Orrell, 2017).

5. The Uncertainty Principle

In quantum physics the uncertainty principle states that, at a subatomic level, quantities such as position or momentum can be known only approximately; measuring one introduces uncertainty in the other. It arises because of the dual wave/particle nature of matter. A particle's position is described by a probabilistic wave function, and is undetermined until it 'chooses' a value during a measurement. Similarly, in the economy, prices are not precisely determined from fundamental properties, nor do they measure some quantity such as utility or labour. Instead they are assigned as an emergent property of the money system and are only indirectly related to the concept of value. Prices are measured through monetary transactions – i.e. exchanges of money objects – which themselves influence the price of the thing being purchased, just as measuring an electron's position by bouncing photons off it changes its momentum.

Economics, therefore, has its own version of an uncertainty principle, which is rooted in the fundamental incompatibility, inherent in money, between precise number and fuzzy value, but feeds through into the rest of the economy as well. In some ways the situation is even worse than in physics, since there is no Heisenberg to tell us a bound on the range of uncertainty. However, this does not mean that we should throw up our arms in despair. Indeed, the message is the opposite: by understanding money we can reduce the uncertainty in the economy.

Acknowledging the dynamic and inherently uncertain behaviour of money changes the way we see the economy, from a mechanical process to a living system, in which money plays the role of a biologically (or psychologically) active substance. This shift in perspective, in turn, affects the way we treat risk and make predictions. If we see price as an emergent feature of the economy, then we can look for general design principles which will help us to reduce risk in the first place. Instead of relying on reductionist models, it makes more sense to use a systems approach that exploits techniques such as complexity theory, network theory and nonlinear dynamics (developed for the study of complex organic systems) and incorporate lessons from other life sciences such as ecology and systems biology (Orrell and McSharry, 2009). And instead of trying to predict the exact timing of market crashes, or the precise economic effects of a trade agreement or a new technology, we should adopt an approach which emphasises humility; search for ways to improve robustness; and retain a flexibility and agility which acknowledges that the future is unlikely to resemble the past. Models are best seen as patches which capture some aspect of the complex system.

Viewed this way, the predictive uncertainty that we confront in economics is not so different from the uncertainty that is taken for granted in other fields where living things are involved, such as medicine. Perhaps the problem is that, because money is based on number, we have become used to the idea that the economy is a kind of predictable, mechanical system – rather than something with a life of its own. But as we've seen, numbers are only one side of the story.

For example, merely bolting a simulated financial sector onto existing DSGE models is unlikely to lead to more accurate predictions. A problem with reductionist models of any sort is that, as they are made more detailed, the number of unknown parameters, whose values cannot be accurately inferred from the data, tends to explode (sometimes called the identification problem, see Romer, 2016). This is one reason why, paradoxically, simple models often outperform complicated models at making predictions (Makridakis and Hibon, 2000). As Benes, Kumhof and Laxton note, DSGE models do not escape this problem when a financial sector is added:

'The existence of nonlinearities, and of evolving financial sector policies to guard against financial crises, poses some very difficult estimation issues. It is well known that the estimation of nonlinear models can require much larger sample sizes to identify functional forms and to detect the very existence of nonlinearities' (Benes, Kumhof and Laxton, 2014, p. 48).

The turbulent, unstable nature of the money system also means that the convenient assumptions of equilibrium, rationality and utility-optimisation – which form the basis of DSGE models – no longer apply. A better approach may be to use simpler (but nonlinear) models that capture the important dynamics (see, e.g., Keen, 2017), while providing realistic, empirically-based estimates of uncertainty. There is also, certainly, a role for more complicated approaches, such as agent-based models (Bruno, Faggini and Parziale, 2016), however these typically involve a large number of parameters and may be better suited to exploring the dynamics of a system than making specific predictions.[2] Statistical approaches, such as machine learning, are also useful for finding patterns in large quantities of data (but rely on the future resembling the past).

As another example, forecasters are frequently asked to spot economic bubbles and predict when they will burst.[3] However, since prices are only loosely tethered to the fuzzy concept of value, and their movements are subject to investor dynamics and psychology, it follows that asking forecasters to predict the exact timing of a crash is no more reasonable than asking a doctor to tell a patient the exact date of a future heart attack. A more realistic approach is to estimate the expected losses under extreme 'fire sale' conditions, and propose ways to protect against these losses (Wilmott, 2001, pp. 505-526).

We can also search for indicators – similar to the biomarkers used in medicine – which warn of the probability of a crash. As Hyman Minsky (1972) showed, one of the main nonlinear feedback loops affecting the price of assets, from stocks to houses, is the credit cycle. The money supply is dominated by bank lending, particularly mortgages, which occurs at a heightened level when economic conditions are good. The easy access to credit drives further price growth in a positive feedback. The process therefore tends to run out of control until reaching a crisis point. Although again the system is not easy to predict – the nonlinear feedback loops make it that way – excessive credit growth can be monitored and used as a warning signal (Eidenberger, Neudorfer, Sigmund and Stein, 2014). It may also be possible to modify the design of the financial system to reduce such feedback loops in the first place. A radical, if often-proposed, step would be to move towards full reserve banking, which takes private banks out of the money creation process altogether (Soddy, 1926).[4]

6. Frame Shift

The uncertainty introduced by the fluid, unstable relationship between price and value affects areas of modelling that may seem far removed from the dynamics of money. The problem is that decision makers have, in many cases, been sold a lie: mechanistic models based on economic principles promise to reduce any problem to abstract calculations of utility, and any shortcoming can be repaired by adding more detail. Ideas about money are, of course, not the only reason for this approach, but they act as a kind of lynch pin which justifies its use.

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[2] As an example from a different context, see Orrell and Fernandez (2010).
[3] Not everyone admits that bubbles exist. As Eugene Fama told the *New Yorker* magazine, 'I don't even know what a bubble means' (Cassidy, 2010).
[4] The same idea has been proposed by a number of economists including Henry Simons, Irving Fisher, Frank Knight, Milton Friedman and Herman Daly.

Consider, as a basis for tackling complex modelling issues, the following two belief sets:

(1) The economy is essentially a machine for optimising utility through barter, and utility can be inferred from prices. Any problem can be approached by breaking it down into parts (e.g. investors, companies), expressing the interactions between the parts in terms of general 'laws', and solving. Model inaccuracies can be addressed by adding more detail. Uncertainty can be computed by taking into account stochastic variations around an equilibrium, rather than through comparisons of the model's performance with reality.

(2) Prices are an emergent feature of market interactions, and are only loosely tethered to the fuzzy social concept of value. Rather than break a complex problem down into parts, it makes more sense to choose the appropriate level of analysis. The preference is for simple models that can be accurately parameterised from existing data. Uncertainty cannot be precisely calculated, but can be estimated based on, for example, a model's track record. Model predictions are compared with actual results, and are updated using a Bayesian approach.

An example of an area where approach (1) is the default, is that of transport forecasting (Forster, 2015). A 2006 study led by economic geographer Bent Flyvbjerg showed that for rail projects, passenger numbers were overestimated in 90 percent of cases, with an average overestimation of 106 percent (Flyvbjerg, et al., 2006). Forecasts were more accurate for road projects, but half had a difference between actual and forecast traffic of more than +/-20 percent, and in a quarter of cases the difference was more than +/-40 percent. Forecast accuracy showed no signs of improving with time, or with more advanced models or computer power. As with VaR or DSGE models, such models reflect an essentially static model of the economy; and they fail to take into account the fact that passengers elect to use, say, a train over their car, is not just the mechanical result of utility optimisation, but involves the same kind of complex, context-dependent interplay between price and value that is at the heart of money (for example, money spent on a car may be experienced very differently from money spent on public transport).

As Flyvbjerg et al. (pp. 13-14) note, the lack of progress in predictive accuracy in recent decades suggests that 'the most effective means for improving forecasting accuracy is probably not improved models but instead more realistic assumptions and systematic use of empirically based assessment of uncertainty and risk'. Model simulations can also be coupled with scenario forecasting techniques to sketch out a range of alternative futures (Zmud et al., 2014). But this change in perspective, and a shift from approach (1) to approach (2), ultimately requires a re-evaluation of the relationship between price and value and, by implication, the role of money.

This view of economic uncertainty in some ways resembles the one promoted by Keynes in his *General Theory of Employment Interest and Money*, the title of which was apparently inspired by Einstein's *General Theory of Relativity* (Galbraith, 1994). According to Keynes, money can be viewed as a type of asset, and the demand for it depends on a number of factors. For example, if investors believe that bonds are overpriced, they may prefer to keep funds in cash; if they are confident in a particular enterprise, they may decide to borrow to invest; or if conditions are highly uncertain, they may decide to hoard savings in the form of cash. Such decisions inevitably rely on views about the future, which are highly uncertain:

> 'If we speak frankly, we have to admit that our basis of knowledge for
> estimating the yield ten years hence of a railway, a copper mine, a textile
> factory, the goodwill of a patent medicine, an Atlantic liner, a building in the
> City of London amounts to little and sometimes to nothing; or even five years
> hence' (Keynes, 1936, pp. 149-150).

One of the roles of the money system as an institution is to meet these fluctuating
requirements. A difference is that in the quantum approach, uncertainty is viewed, not just as
the result of future unknown fluctuations in the economy, but as an inherent feature of the
financial system arising directly from the nature of money.

7. Conclusion

The traditional test of scientific models has long been to make empirically validated
predictions. By this standard, economic models have failed spectacularly. But a greater
concern is that when misused they actually help to create risk and instability. By modelling the
economy as an inherently stable system, they give a false sense of security. One of the main
causes of the 2008 crash was exactly the risk models and DSGE models which ignored the
effects of money. These models encouraged risk taking by assuring us that risk can be
calculated – and even removed using hedging strategies. Modellers therefore have an ethical
requirement to address these issues (DeMartino and McCloskey, 2016), and a first step is to
acknowledge the active role of money, and the unstable link it forges between price and
value.

Money is not a neutral medium of exchange, but a remarkably complex substance
which has profound effects both on the human mind, and the economy as a whole. Its power
lies on its unique combination of the properties of number, with those of an owned thing.
Searle, for example, compares ownership of money with possession of a queen in the game
of chess. The latter,

> 'is not a matter of my having my hands on a physical object, it is rather a
> matter of my having certain powers of movement within a formal system …
> relative to other pieces. Similarly, my having a thousand dollars is not a
> matter of my having a wad of bills in my hand but my having certain deontic
> powers. I now have the right, i.e. the power, to buy things, which I would not
> have if I did not have the money' (Searle, 2005, p. 16).

However money is a special kind of institution, and has a special kind of power, because of its
association with number. This is why currencies used in games can, quite often, cross over
and be used as a form of money to buy things in the real world (Castronova, 2014), but chess
pieces can't.

Acknowledging that market prices are an emergent phenomenon of the money
system changes our ontological framework for economic modelling and helps us to make
decisions under uncertainty in two ways. The first is that it shifts our mental perspective from
seeing the economy as an essentially stable, optimal, mechanical system to seeing it as a
dynamic, organic system; and from treating it as a highly-tuned machine that occasionally
breaks for no apparent reason, to a lively system where change is the norm. This, in turn,
means that probabilistic risk models based on assumptions of stability and efficiency, and
traditional hedging instruments which attempt to remove that risk, should be replaced by

models which acknowledge that the risk is not something that can be precisely calculated or simply engineered away. Complicated models based on detailed calculations of utility should be replaced by simpler and more transparent models based on more realistic assumptions. And models used to forecast the economy should account for money, debt and the financial sector.

Secondly, an appreciation of the fluid and connected nature of money points towards ways of making the economy more stable. Only by seeing risk can we do something about it. For example, we can learn from properties, such as redundancy and modularity, which lend stability to natural systems such as ecosystems (May, Levin and Sugihara, 2008).

Finally, and on a less serious note, forecasters have long tended to favour theories which give them an excuse for prediction error. According to efficient market theory, markets are unpredictable because they are so perfect that all changes are completely random and no one can beat the market. According to the butterfly effect, even tiny changes to a chaotic system – be it the weather or the economy – can lead unpredictably to large effects down the road. However, the problem with markets from a quantum perspective is not that they are completely random or chaotic but that, like quantum matter, they have uncertainty built in. While this may seem like bad news for forecasters, it does at least offer the perfect excuse when predictions go wrong: forecasting the economy is more difficult than quantum physics.

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References

Ahir, H. and Loungani, P. (2014) *Can economists forecast recessions? Some evidence from the Great Recession.* Discussed in Harford, T. (2014) 'An astonishing record – of complete failure.' *Financial Times,* May 30.

Arrow, K. J. and Debreu, G. (1954) 'Existence of a competitive equilibrium for a competitive economy.' *Econometrica,* 22, pp. 65–90.

Baaquie, B. E. (2007) *Quantum Finance: Path Integrals and Hamiltonians for Options and Interest Rates.* Cambridge: Cambridge University Press.

Benes, J., Kumhof, M. and Laxton, D. (2014) 'Financial crises in DSGE models: a prototype model.' *IMF Working Papers,* 14 (57).

Bernanke, B. (1995) 'The macroeconomics of the Great Depression: a comparative approach.' *Journal of Money, Credit, and Banking,* 27 (1), pp. 1–28.

Bernanke, B. (2009) Commencement address at the Boston College School of Law. Newton, MA, 22 May.

Bernanke, B., Gertler, M. and Gilchrist, S. (1999) 'The financial accelerator in a quantitative business cycle framework.' In J. Taylor, and M. Woodford (Eds.) *Handbook of Macroeconomics*, Vol. 1, pp. 1341-1393). Amsterdam: Elsevier.

Bruno, B., Faggini, M. and Parziale, A. (2016) 'Complexity modelling in economics: the state of the art.' *Economic Thought* 5, (2), pp. 29-43
http://et.worldeconomicsassociation.org/files/WEA-ET-5-2-Bruno-et-al.pdf

Castronova, E. (2014) *Wildcat Currency: How the Virtual Money Revolution Is Transforming the Economy Hardcover.* New Haven, CT: Yale University Press.

Cochrane, J. H. (2011) 'Presidential address: discount rates.' *The Journal of Finance,* 66 (4), pp. 1047-1108.

DeMartino G. and McCloskey D. (Eds.) (2016) *The Oxford Handbook of Professional Economic Ethics*. Oxford: Oxford University Press.

Edgeworth, F.Y. (1881) *Mathematical psychics: An essay on the application of mathematics to the moral sciences.* London: C.K. Paul.

Eidenberger, J., Neudorfer, B., Sigmund, M. and Stein, I. (2014) 'What Predicts Financial (In)Stability? A Bayesian Approach'*.* Deutsche Bundesbank Discussion Paper 36/2014.

Fama, E. F. (1965) *Random walks in stock-market prices.* Chicago: Graduate School of Business, University of Chicago.

Fama, E. F. (1991) 'Efficient capital markets II.' *The Journal of Finance,* 46 (5), pp. 1575-1617.

Forster, A. (2015) 'Can anyone save us from the misuses of transport modelling?' *Local Transport Today*, 13 November.

Flyvbjerg, B., Holm, M. S., and Buhl, S. L. (2006) 'Inaccuracy in traffic forecasts.' *Transport Reviews,* 26 (1), pp. 1-24.

Galbraith, J. (1994) 'Keynes, Einstein, and scientific revolution.' *The American Prospect*, 5 (Winter), pp. 62-7.

Haldane, A. (2014) 'The Revolution In Economics' in *Economics, Education and Unlearning: Economics Education at the University of Manchester*, pp. 3-6. Manchester: Post-Crash Economics Society.

Haven, E. E. and Khrennikov, A. (2013) *Quantum Social Science.* Cambridge: Cambridge University Press.

Jakab, Z. and Kumhof, M. (2015) 'Banks are not intermediaries of loanable funds – and why this matters.' *Bank of England working papers* 529.

Jevons, W. S. (1875) *Money and the Mechanism of Exchange.* New York: D. Appleton & Co.

Keen, S. (2015) *Will We Crash Again? FT/Alphaville Talk.* Available at: https://www.youtube.com/watch?t=130andv=JKy6_yy3C3U

Keen, S. (2012) *The IMF Gets Radical?* Retrieved from Business Spectator: November 5. Available at: http://www.businessspectator.com.au/article/2012/11/5/business-spectator/imf-gets-radical

Keynes, J. M. (1936) *The General Theory of Employment, Interest and Money.* New York: Harcourt, Brace.

Kiyotaki, N. and Wright, R. (1989) 'On money as a medium of exchange.' *The Journal of Political Economy,* 97 (4), pp. 927-954.

Knapp, G. (1924) *The State Theory of Money.* London and New York: Macmillan.

Lucas, R. (2009) 'In defence of the dismal science.' *The Economist,* August 6.

Makridakis, S. and Hibon, M. (2000) 'The M3-Competition: results, conclusions and implications.' *International Journal of Forecasting,* 16, pp. 451–76.

May, R.M., Levin, S.A. and Sugihara, G. (2008) 'Ecology for bankers.' *Nature*, 451, pp. 891–93.

Minsky, H. P. (1972) 'Financial instability revisited: the economics of disaster.' In: *Reappraisal of the Federal Reserve Discount Mechanism*, pp. 95–136. Washington, DC: Board of Governors of the Federal Reserve System.

Ormerod, P. (2000) *Butterfly Economics: A New General Theory Of Social And Economic Behavior.* New York: Basic Books.

Orrell, D. (2012) *Truth or Beauty: Science and the Quest for Order.* New Haven, CT: Yale University Press.

Orrell, D. (2016). 'A Quantum Theory of Money and Value.' *Economic Thought*, 5.2, pp. 19-28 http://et.worldeconomicsassociation.org/files/WEA-ET-5-2-Orrell.pdf

Orrell, D. (2017) *Economyths: 11 Ways That Economics Gets it Wrong.* London: Icon Books.

Orrell, D. and Chlupatý, R. (2016) *The Evolution of Money.* New York: Columbia University Press.

Orrell, D. and Fernandez, E. (2010) 'Using predictive mathematical models to optimise the scheduling of anti-cancer drugs.' *Innovations in Pharmaceutical Technology,* 33, pp. 58–62.

Orrell, D. and McSharry, P. (2009) 'System economics: Overcoming the pitfalls of forecasting models via a multidisciplinary approach.' *International Journal of Forecasting,* 25, pp. 734–743.

Romer, P. (Forthcoming) 'The Trouble With Macroeconomics.' *The American Economist.* Available at: https://paulromer.net/the-trouble-with-macro/

Samuelson, P. A. and Nordhaus, W. D. (2001) *Economics,* (17th ed.). Boston, MA: McGraw-Hill.

Searle, J. R. (2005) 'What is an institution?' *Journal of Institutional Economics,* 1 (1), pp. 1-22.

Soddy, F. (1926) *Wealth, virtual wealth and debt. The solution of the economic paradox.* New York: Dutton.

Tett, G. and Gangahar, A. (2007) 'Limitations of computer models.' *Financial Times,* 14 August.

Turner, A. (2014) 'Printing money to fund deficit is the fastest way to raise rates.' *Financial Times*, 10 November. Available at: http://www.ft.com/intl/cms/s/0/8e3ec518-68cf-11e4-9eeb-00144feabdc0.html/

White, W. R. (2013) 'Is monetary policy a science? The interaction of theory and practice over the last 50 years.' In: M. Balling, and E. Gnan (Eds.), *50 Years of Money and Finance – Lessons and Challenges.* Vienna: SUERF.

Wilmott, P. (2001) *Paul Wilmott Introduces Quantitative Finance.* Chichester: John Wiley.

Wilmott, P. and Orrell, D. (2017) *The Money Formula: Dodgy Finance, Pseudo Science, and How Mathematicians Took Over the Markets.* Chichester: Wiley.

Zmud, J. P., Barabba, V. P., Bradley, M., Kuzmyak, J. R., Zmud, M. and Orrell, D. (2014) *Strategic Issues Facing Transportation, Volume 6: The Effects of Socio-Demographics on Future Travel Demand.* NCHRP Report.

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About Waged Labour: From Monetary Subordination to Exploitation

Jean Cartelier, Université Paris-Ouest, EconomiX
jean.cartelier@gmail.com

Abstract

Wage-earners voluntarily accept to work under the control, and for the account of, firms run by entrepreneurs;[1] they do not decide what, how and how much, they must produce; wage-earners are not responsible for the consequences of their activities when they comply with entrepreneurs' orders;[2] inside the firm, wage-earners are subordinates. Outside the firm, wage-earners freely choose the way they spend their wages in the markets for commodities and services. Such is the 'stylised fact' which characterises the wage relationship in our economies. Any theory of the wage relationship should account for this 'stylised fact' by deriving it from a consistent set of assumptions and propositions.

Three main propositions are advocated in this paper:

1. Mainstream economists conceive the 'wage' as being the price of a commodity ('labour power' or 'human labour') determined by a market – as for any other commodity and service. As a consequence, the wage relationship is thought of as an exchange relation ruled by equivalence; *this view cannot be derived from the usual basic assumptions without violating the very logic of mainstream theory*. Following this logic:
   - either the wage relationship should be thought of as a relation between human beings having such different conditions that it cannot be interpreted as an exchange ruled by equivalence
   - or 'human labour' is not to be found within the commodity space.

In any case, the 'stylised fact' mentioned above is not accounted for by mainstream theory.

2. 'Wage' is the name of the payment entrepreneurs give to other people with the view to making them participate in production under their control and for their account; *wage payment is neither a purchase nor a sale* – it just allows wage-earners to enter the market and spend in order to acquire the commodities they desire

3. Wage-earners are, economically speaking, a *means* used by entrepreneurs for their own ends; *exploitation* (Fleurbaey's M-exploitation) is inherent in the wage relationship.

Propositions 2 and 3 do not fit general equilibrium theory (inspired by Walras and rationalised by Arrow-Debreu); they do not fit modern mainstream theory either. They have no room in the theory of prices of production (inspired by Ricardo and rationalised by Sraffa). Moreover, they are not compatible with Marx's theory of labour power. An alternative approach is needed to satisfy them.

Paving the way for that alternative theory requires us to show that 'human labour' cannot belong to the commodity space *from the very point of view of mainstream theory*; a sharp incompatibility

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[1] 'Entrepreneur' here means, following Coase*,* 'the person or persons who, in a competitive system, take the place of the price mechanism in the direction of resources' (Coase, 1937, p. 388).

[2] David Ellerman distinguishes between factual/*de facto* and legal or *de jure* responsibility. What I mean here is economic responsibility only. Another way at looking at it may use David Ellerman's propositions. The 'Invisible Judge' market gives the entrepreneur the property of raw material and labour – and also of the finished product sold in the market. The market gives nothing to the wage-earner *inside* the firm; *outside* the firm it gives her the property of consumption of goods she acquires out of her wage. *Inside* the firm, the wage-earner is not economically responsible. Arguing that if she kills someone, the wage-earner is responsible has nothing to do with the 'Invisible Judge'!

between assumptions and conclusions would follow, and justify resorting to an alternative approach. This is our first step. A second step is to effectively resort to a *monetary analysis* – the alternative approach to real analysis, according to Schumpeter in his *History of economic analysis*. In a nutshell, we have to discard the commodity space postulate, and to think of economic relations as *money mediation*. Instead of a commodity space, we presuppose money to be a unit of account ($) combined with a means of payment. Instead of a permutation of goods and services exchanged amongst people, economic relations are *payments*. Individuals are no longer endowments and preferences, but *accounts* into which payments write down quantities of $. *Conditions of people may differ according to the form of money circulation* – this view allows us to deal with different types of economic relations; for what matters here, the wage relationship *involves a specific form of circulation not reducible to that of exchange*. The final step is to suggest that *exploitation is inherent in the wage relationship*; such exploitation has nothing to do with justice, since there is no norm whatsoever for the level of wage; it is also quite different from the exploitation Marx thought he had unveiled. This exploitation is simply due to the special situation of wage-earners *vis-à-vis* the market, which a specific form of circulation makes clear.

Keywords: Labour, exploitation, monetary circulation, wage

JEL Classification: A10, E40, J30

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1. 'Human Labour' does not Belong to the Commodity Space if not with the Human Beings who Perform it

The starting point of any theory of value is a given commodity space. It is especially clear in modern mainstream theory where the commodity space is the Euclidian space R^l in general equilibrium theory or a continuum $[0,1]$ in search models. People who populate the economy are grasped by reference to the commodity space: initial endowments (points of R^l) and preference function (defined in R^l). Among the goods belonging to that space, Debreu (1959) cites 'Number 2 Red Winter Wheat' and 'human labour'. Many other items could be added, such as trucks and truck services, for example.

Listing all these goods is tantamount to listing all the markets in which they may be traded against each other, depending on the behaviour of individuals who do not belong to the commodity space. To know whether a determinate item is, or is not, to be found there is not an empirical matter. Consider, for instance, money. 'What kind of monetary theory is possible?' is not an open question once theoreticians have decided that money is a special good, being not privately produced, and useless for consumption and production. If money is an element of the commodity space under the name of 'fiat money', the basic question theory must solve is: does 'fiat money' have a positive price in general equilibrium in spite of its special properties? Whatever the solution may be, it is impossible to think of money in the context of a set of rules (an institution) but, instead, as a commodity (very special indeed).

What is true for money is even more obvious for 'human labour'. It is only because they conceive the wage relationship as an exchange relation that mainstream economists find 'human labour' in the commodity space. Their basic vision is that individuals endowed with 'human labour' supply it in a 'market for labour', while individuals needing to produce something with the help of 'human labour' offer some bundles of commodities (the real wage). Assuming that 'human labour' belongs to the commodity space is by no means the result of

an empirical observation, but the by-product of a theoretical stance on the nature of the wage relationship. Is that a legitimate and fruitful theoretical stance?

To elucidate the point, a clear answer to the following question is in order: what is (are) the condition(s) which make(s) acceptable an inscription of 'human labour' in the commodity space?

The answer should be clear to everybody: 'truck services' and 'human labour' cannot be found in the commodity space but with their respective sources – i.e., 'trucks' and 'workers'. A 'truck service' without a 'truck' is no more conceivable than 'human labour' without a 'worker'. The mere fact that it is generally assumed that there is a choice between *buying* the 'truck' in order to get its services or *hiring* the 'truck' for a given duration confirms their common presence in the commodity space. What is true for 'trucks' should also be true for 'workers'.

If so, we should have at least two kinds of human beings: on the one hand, the usual agents who trade commodities in different markets who are not found in the commodity space and, on the other hand, the 'workers' who stand there along with 'trucks', 'Number 2 Red Winter Wheat' and 'human labour'. But mainstream economists do not follow that line of reasoning when labour and the wage are talked about, although they do when other commodities are dealt with. Applied to labour, such reasoning prevents us from thinking of the wage relationship as an exchange since:

- either 'workers' are themselves the commodities which are traded in a labour market by the usual agents (who have them as endowments and as arguments of their utility functions) – but what is described is not a wage relationship, but a slave economy;
- or it is admitted that 'workers' enter the market to negotiate the sale of their 'human labour'. But the conditions of the 'workers' and the 'usual agents' are so different that no equivalence in exchange could make sense.[3]

In other words, the normal reasoning in mainstream economics, when applied to labour, does not legitimise the vision of the wage relationship as being an exchange ruled by equivalence, which is, however, the expected result of assuming that 'human labour' is in the commodity space. In order to preserve their social prejudice and to theoretically support it, mainstream economists have to be twice untrue to their usual method.

A first infraction consists of ignoring the fact that 'workers' can be traded amongst the usual agents, which amounts to stating that slave economies should not be dealt with. Such a stance cannot be justified except by a moral argument.[4] Slavery is an abomination, but to ignore it does not prevent 'workers' from being in the commodity space along with 'human labour'. 'Workers' and 'human labour' are *physically* related as are 'trucks' and 'truck services'. While 'human labour' is supposed to be in the commodity space, 'workers' are also there – even if they are not sold. 'Workers' and usual agents are still two different kinds of human beings, the condition of the former being not clearly stated so far. Which 'human labour' may be traded in that strange environment, and how is it done?

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[3] In his comment David Ellerman misunderstands the term 'equivalence'; he admits some degrees, as if an exchange relation may be more or less equivalent. If a wage relationship is not an exchange, which is what I am trying to show, there is no point asking how far from equivalence a wage relationship is. Such a misunderstanding is astonishing, since David Ellerman may be credited with having raised a good question about the employment contract – that of legitimacy. An employment contract is not more or less legitimate by comparison with a commodity sale: it is or it is not! In the same manner, a wage relationship is not more or less equivalent: it is not! No norm can be found for determining the wage rate if it does not result from an exchange relationship.

[4] Some authors disagree with such an argument (Nozick, for instance).

The necessity to remedy that indeterminacy gives the opportunity of a second infraction to the ordinary method of mainstream theory. Mainstream economists not only ignore slavery, but they also expel 'workers' from the commodity space, pretending nevertheless to keep 'human labour' as an element of it. By virtue of the *physical bind* alluded to above, expelling 'workers' means expelling 'human labour' as well. 'Human labour' being no longer in the commodity space, it would be a nonsense to make it a possible item of usual agent endowments and a possible object of trade.

To sum up, once the double infraction is corrected, we are left with:

* either 'human labour' being in the commodity space, with no possibility of conceiving the wage relationship as an exchange since the condition of 'workers', although not well-defined, radically differs from that of usual agents;
* or 'human labour' not being in the commodity space, which means that only a pure exchange economy may be dealt with, where usual agents share the same condition and trade amongst themselves according to equivalence. Such an economy does not host any wage relationship.

According to the ordinary logic of mainstream theory, dealing with 'human labour' as a commodity requires that 'workers' who perform 'human labour', on the one hand, and usual agents who use it, on the other, belong to different classes of people. Such is the case in the agency models widely used in 'labour economics'. They presuppose that a usual agent (a 'Boss' in Simon, 1951) concludes a contract with a 'worker' without making it clear how 'bosses' and 'workers' are manifested. Sweeping the tricky issues under the carpet is not good practice, even if it helps to preserve social prejudices.

It is better to stop dealing with 'human labour' as if it were a commodity and to stick to the image of an exchange economy where independent producers (usual agents) are specialised and exchange amongst themselves the commodities they have freely chosen to produce. No human being can be found in the commodity space. Each producer privately knows the disutility of his/her effort, but no effort is to be found in the commodity space: efforts are not common knowledge. Consequently, there is no room for a wage relationship in such an economy.[5]

Accounting for the 'stylised fact' characterising the wage relationship requires us to give up value theory reasoning and focus on understanding how human beings of different conditions may coexist in a market economy.

2. The Wage Relationship is a Monetary Subordination; Means of Payment Circulation Makes it Clear

By its construction, mainstream theory deals only with one type of economic relation: exchange ruled by equivalence. The 'stylised fact' above implies that economic theory should be capable of accounting for at least two different types of economic relation: *exchange* between people sharing the same condition, and the *wage relationship* between entrepreneurs and wage-earners. Such theory exists. It is radically different from the mainstream, but it is not new. Schumpeter, in his *History of Economic Analysis,* compared the real (value theory) and monetary approaches and maintains that this represents the main split

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[5] Attacking the mainstream at its foundations, contrary to what David Ellerman affirms, is the strongest *theoretical* critique possible (at least for those who attach a high prize to the internal consistency of a theory).

in our discipline. Here, we will follow in Steuart's and Keynes' footsteps (to name two ancestors of this approach) and we will adopt a starting point radically opposed to the mainstream. Instead of presupposing a commodity space, we start from the idea that *economic relations are made of payments*. This requires three postulates: (i) *unit of account* (say, the $), (ii) a definition of individuals as *accounts* in which (iii) payments write down quantities of $. The table below shows how far from mainstream theory we go if we follow the idea that *money mediation* is the basis of economic relations.

	General equilibrium theory	Monetary approach
Basic postulate	Commodity-space R^l	Nominal unit of account ($)
Active individuals	Preferences defined on R^l	Accounts where quantities of $ are written down
Relations	Generalised exchange: permutation of commodities	Dollar transfers from one account to another for settlements of debts
Condition of relations	Initial endowments ($\in R^l$)	To be eligible for the minting process

Economic relations may be summed up by a *payment matrix* displaying the different payments performed during a given period:

$$M = \begin{pmatrix} 0 & m_{12} & \cdots & m_{1H} \\ m_{21} & 0 & \cdots & m_{2H} \\ \cdots & \cdots & \cdots & \cdots \\ m_{H1} & m_{H2} & \cdots & 0 \end{pmatrix}$$

with m_{hk} being the payment made by individual h to individual k.

This is not the proper place to detail every aspect of this approach.[6] Two points, nevertheless, have to be mentioned: (i) prior to any payment between people, a means of payment has to be available from another source (i.e. a monetary authority which cannot be an ordinary individual, but an institution); (ii) let us call the issuance of means of payment the *minting process.* On the basis of the postulates above, many forms of circulation can be imagined.

Here is the clue to the plurality of economic relations that a monetary approach can deal with, as opposed to mainstream theory. *The nature of economic relations is entirely determined by the form of money circulation*.

When *all* human beings (accounts) have access to the minting process, they share the same condition: they are all able to intervene directly in the market (to run a specialised activity according to their free will). They are able to spend independently from each other. Translated into plain language: they are free to decide in which type of activity they will specialise (under the constraint of the minting process). Decentralised decisions – payments coming from other people – validate (or not) individual choices, leaving room for balance of payment settlements (note, incidentally, that disequilibrium is the rule, equilibrium the exception). This form of circulation may be said to characterise pure exchange relations. Figure 1 illustrates the point:

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[6] See Cartelier (forthcoming), *Money, Markets, Capital. The Case for a Monetary Approach*, Routledge.

Figure 1
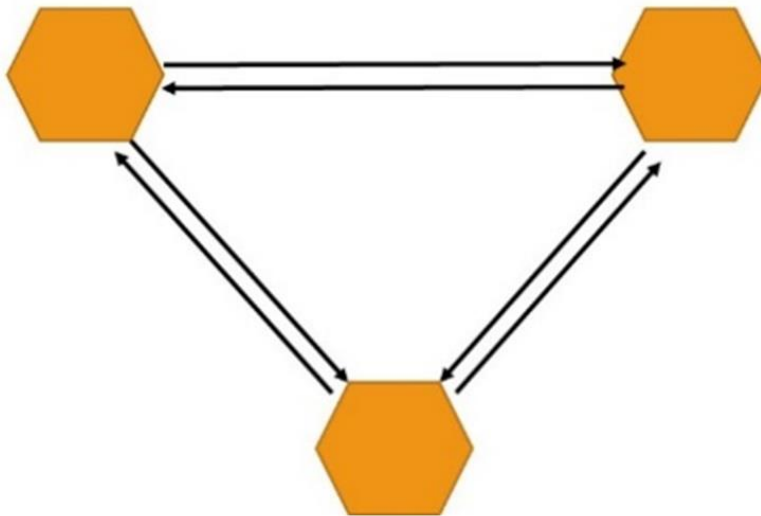
When only a *fraction* of human beings have access to the minting process (let us call them 'active human beings'), this generates a *difference of condition*. Those people who do not have access to the minting process cannot intervene directly in the market, which means that they are unable to run an independent process of specialisation. They are unable to exist economically, since they cannot perform any payment. *Their existence as economic agents is entirely conditional on the payments made to them by the active human beings*. These transfers may have different motivations and generate diverse forms of circulation. For what interests us, the wage relationship can be represented by the form below in Figure 2.

Figure 2
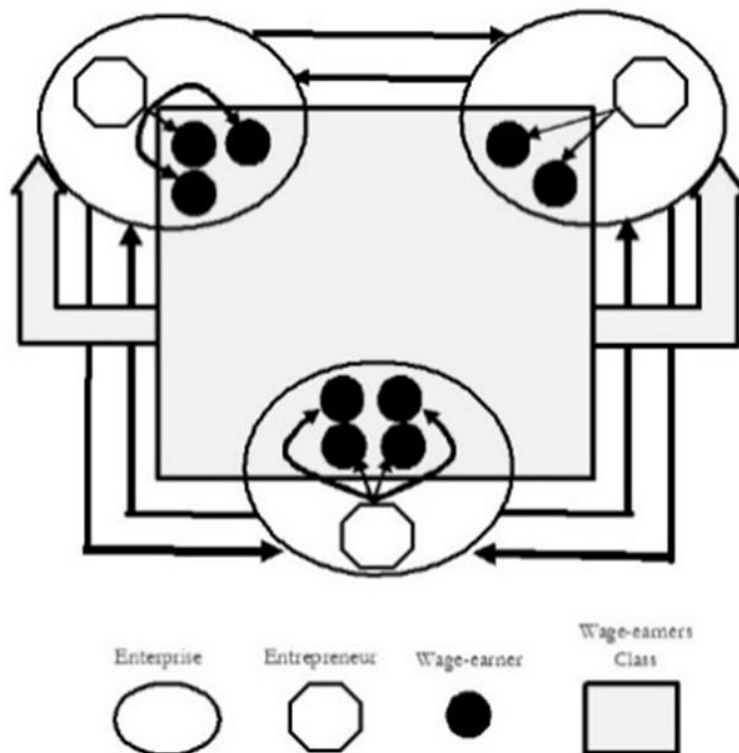
Active human beings (represented by the hexagons in figure 2) make some non-active human beings (the black circles) participate in their own market specialisation. That process defines firms (the ovals encircling both types of human being), with active people being the *entrepreneurs* and non-active people the *wage-earners*. While the former have the capacity to choose their specialisation, the latter have not. Consequently they work for the account of the firm and of the entrepreneur. Wage-earners are not responsible for what firms produce and their relation with the market is not direct, but only occurs via the entrepreneurs: they are subordinate to them. *Wage payments* (black arrows in the oval of the firm) *cannot be interpreted as a market relation, nor as an exchange*. They are *sui generis* operations shaping a specific relation: the *wage relationship*.

This relation is twofold:

- Inside the firm, wage-earners work for the account of the entrepreneur, who is economically responsible for the firm's activity. Wage payment is unilateral: it submits wage-earners to the firm;
- Outside the firm, wage-earners spend their wage as they please in a way which does not distinguish them from other people; nothing prevents them from having *the same non-economic conditions* as other people (citizenship, property rights, and so on).

The monetary approach of the wage relationship perfectly fits the 'stylised fact' reported above, i.e. a *monetary subordination* inside the firm compatible with a full political citizenship and the freedom to spend wages in the market.

A deeper analysis (see Cartelier, 2016) develops the idea that *wages are a cost* for the firm (cost is a meaningless notion in a pure exchange economy) while payments between firms (or entrepreneurs) appear as *gross profits*. The internal logic of the wage relationship circulation (Figure 2) differs significantly from that of exchange (Figure 1). The latter validates specialisations chosen by active people; the former is centered on the difference between proceeds and costs, i.e. on profits. This is reminiscent of Marx who, in *Capital,* opposes $C - M - C'$ (with $C = C'$) and $M - C - M'$ (with $M' > M$). Along that line of reasoning, it is worth emphasising that the two elements of the wage relationship (respectively wage payment and payments out of wages) join in a unique process; the square in Figure 2 encompasses the whole of wage-earners to make it clear that wage-earners form a group (a 'class' as Marx would say).

That some human beings – wage-earners – appear to be (and are) a cost for others (firms and entrepreneurs) is the most significant and specific characteristic of a market economy when embedded in a wage relationship. This is probably the essential feature which distinguishes a market economy from an exchange economy – where everybody is in a symmetric position vis-à-vis *anybody else.*

In spite of the apparent homogeneity of economic relations, using the concept of money mediation we can visualise two very different relationships – thanks to a monetary approach. The main 'stylised fact' of the wage relationship, i.e. the coexistence of subordination inside the firm and freedom in the market, is reproduced in our approach, whilst it is impossible within Ricardian and Sraffian theories (which fail to account for freedom) and to mainstream theory (which fails to account for subordination).

The monetary approach also provides an alternative to Coase's theory, which argues that the co-existence of exchange (in the market) and hierarchy (inside the firm) is the result of an arbitrage about relative costs:

'We may sum up (...) the argument by saying that the operation of a market costs something and by forming an organization and allowing some authority

(an "entrepreneur") to direct the resources, certain marketing costs are saved'
(Coase, 1937, p. 392).

Coase's view, interesting as it is, leaves unsettled the question of by whom and how such an arbitrage is performed.

3. Exploitation of Wage-earners by Entrepreneurs is Inherent in the Wage Relationship

Amongst the many topics within a theory of the wage relationship, exploitation is without a doubt the hottest. Two types of *exploitation (in the economic sense)* are currently discussed.

The first one is very general since it refers to a *norm*. Any economic agent who gets less from the market than the norm is considered to be exploited by any other who gets more. For example, if the norm is marginal productivity, any holder of a production factor would be considered by those whose income is greater to have been exploited if his/her income is less than that norm. This notion of exploitation is not specific to the wage relationship (wage-earners may exploit not only entrepreneurs, but also land owners) and has something to do with social justice.

A second interpretation of exploitation is specific to the wage relationship. Marx is the main reference. Wage-earners are exploited when the value of the labour power – which is determined by the quantity of social labour involved in its production, *like for any other commodity* – is less than the quantity of value its utilisation provides to the capitalist. That difference is called *surplus value* and may be interpreted as non-paid labour, according to Marx. Here, the exploitation of workers by capitalists relies on the norm, given by the labour value theory.

These notions of exploitation are not acceptable as far as the wage relationship is concerned.

The Marxian theory of exploitation relies on two concepts – the labour theory of value and labour power as a commodity. But both these concepts are incorrect *from the point of view of Marx's commodity theory*: (i) there is no quantitative determination of labour values respecting Marx's idea of the double character of labour embodied in a commodity;[7] (ii) labour power is not a commodity since it does not satisfy the condition put forward by Marx 'to be privately and independently produced' (see Cartelier, 1991).

The normative theory of exploitation may be meaningful when applied to transactions ruled by equivalence (as is the case in competitive general equilibrium theory). But it cannot apply to the wage relationship: 'human labour' (which is what Marx called 'labour power') does not belong to the commodity space; humans are not commodities. As we have seen above, the wage relationship is not mediated by a commodity, but exists as a specific form of money circulation.

Exploitation has to be reexamined on this new basis. The wage relationship differs from exchange due to the difference of condition between entrepreneurs (or independent producers having access to the minting process) and wage-earners. Elaborating a little further, the effects of this difference lead to a pertinent notion of exploitation.

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[7] Stavros Mavroudeas does not agree (this is an understatement) with my thesis. But he does not discuss my point. I do not pretend to give an explanation of how capitalism was born, nor to give a fully-fledged view of the working of capitalist economies. Concerning Marx, who is not at the centre of my paper, I am content to point out some inconsistencies in his economic reasoning. The definition of commodity production he provides should not allow him to treat labour power as a commodity. He has to do so, however, to elaborate his surplus value theory. Marxists too often turn a blind eye to these logical flaws. It is a pity.

An independent producer or entrepreneur freely decides what, how and how much he/she produces. The counterpart of that freedom is that he/she complies with decisions of other independent producers. Freedom and responsibility are the two sides of the same coin. Prices and quantities determined by the market are objective, and all independent producers take them as such.

Consequently, any independent producer or entrepreneur decides his/her expenditures (or efforts) taking into consideration his/her expected proceeds (reward). Mainstream theory is crystal-clear on this point: an independent producer maximises his/her satisfaction, which implies that the marginal utility of the reward just compensates for the marginal disutility of the effort (labour). In a monetary approach, the same is true but expressed as the equality between expected proceeds and expenditures (Keynes's effective demand theory applied at a microeconomic level).[8]

Very different is the situation of wage-earners. They decide neither what, how nor how much to produce. A clear consequence is that wage-earners do not master their reward nor their efforts. The unique arbitrage open to wage-earners is not to equalise marginal utility of reward and disutility of effort, but to equalise disutility of effort and risk of being fired, which depends on the internal organisation of the firm, not on the market. In money terms, wage-earners decide their expenditures, not their reward (this is reminiscent of Keynes's rejection of what he called 'the second classical postulate'). A straight consequence of the specificity of the wage relationship is that wage-earners have only an *indirect* relation with the market through entrepreneurs. Entrepreneurs may go bankrupt if disequilibrium is too great, and wage-earners lose their jobs – which is not at all the same thing.

To sum up, two differences in the condition of entrepreneurs and wage-earners are meaningful:

- entrepreneurs and independent producers master the two elements of their budgetary constraint, while wage-earners master only their expenditures (not their reward);
- entrepreneurs and independent producers determine their efforts through an *arbitrage in the market*, wage-earners determine their efforts through an *arbitrage inside firms.*

In this double difference lies exploitation.

If we consider the different types of exploitation enumerated by Fleurbaey, the exploitation inherent in the wage relationship is the one he calls *M-exploitation*: any human being utilised by another human being *as a means* oriented to his/her own ends. This is precisely what characterises the wage relationship. The specific form of money circulation shows clearly the monetary subordination of wage-earners (compatible, as we know, with full citizenship and property rights). We have seen above that wage-earners are a cost for entrepreneurs. So, expressed in another way: wage-earners are used as a means by entrepreneurs to get profits. Consequently, wage-earners do not master their efforts, which are determined by the organisation of the firm.

Modelling the differentiation between entrepreneurs and wage-earners may provide a quantitative expression for the exploitation inherent in the wage relationship (Cartelier, 2014). If x is the effort resulting from the arbitrage inside the firm and if y is the effort resulting from the arbitrage in the market, the rate of exploitation may be defined as $\frac{y-x}{x}$.

That notion of exploitation does not depend on the level of wage and, more generally, has no relation with income distribution. Neither does it concern any idea of social justice in an economic sense. No economic norm is relevant except the one we have emphasised, that

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[8] In both cases second-order conditions matter but this 'technicality' may be neglected here.

is, the differences between their relation to the market (direct for entrepreneurs, indirect for wage-earners). The heterogeneity of condition, which prevents us from assimilating the wage relationship and exchange, also prevents us from considering, as Coase seems to believe, that market and hierarchy are just two modes of coordination between which an arbitrage – in terms of cost – is possible.

Acknowledgements

References

Cartelier, J. (1991) 'Marx's theory of value, exchange and surplus-value: a suggested reformulation.' *Cambridge Journal of Economics*, 15, pp. 257-269.

Cartelier J. (2014) 'Entrepreneurs and wage-earners: a monetary approach.' *EconomiX Working Papers*, pp. 2014-19.

Cartelier J. (2016) *L'intrus et l'absent. Essai sur le travail et le salariat dans la théorie économique.* Presses Universitaires de Nanterre, Paris.

Cartelier J. (Forthcoming) *Money, Markets, Capital. The Case for a Monetary Approach.* Routledge: Abingdon.

Coase R. (1937) 'The nature of the firm.' *Economica*, 4, pp. 386-405.

Debreu G. (1959) 'Theory of value, an axiomatic analysis of economic equilibrium,' Cowles Foundation, monograph 17, Yale University Press.

Ellerman, D. (2017) 'Comment on: "About waged labour: from monetary subordination to exploitation".' *Economic Thought*, 6.2, pp. 37-45. http://www.worldeconomicsassociation.org/files/journals/economicthought/WEA-ET-6-2-Ellerman.pdf

Fleurbaey M. (2014) 'The facets of exploitation.' *Journal of Theoretical Politics*, 26(4), pp. 653-76.

Mavroudeas, S. (2017 'Is Cartelier's Monetary Approach a Convincing Alternative to the Labour Theory of Value? A Comment.' *Economic Thought*. 6.2, pp. 46-53. http://www.worldeconomicsassociation.org/files/journals/economicthought/WEA-ET-6-2-Mavroudeas.pdf

Simon H. (1951) 'A formal theory of the employment relationship.' *Econometrica,* 19, pp. 293-305.

Sraffa P. (1960) *Production of Commodities by means of Commodities*. Cambridge University Press: Cambridge.

Comment on 'About Waged Labour: From Monetary Subordination to Exploitation'

David Ellerman, University of California at Riverside, University of Ljubljana, Slovenia
david@ellerman.org

1. Introduction

To analyse this paper, I have to alternate between two perspectives: first, as a defender of neoclassical orthodoxy against attacks, and second, as a critic of waged labour (Ellerman, 1993; 2015; 2016). From the first point of view, I do not think that Cartelier has successfully breached the neoclassical fortress – although there are some promising beginnings.

In the Introduction, and elsewhere in the paper, Cartelier states that neoclassical theory views the wage relationship as 'an exchange relation ruled by equivalence' and then argues in various ways that there is no 'equivalence'. However, 'equivalence' is never defined, but it seems to be a paraphrase for an 'exchange relation in a competitive market,' e.g., as found in the Arrow-Debreu model. But the neoclassicals are, of course, aware that labour markets are often non-competitive and imperfect in many ways, and they even have their own theory of 'exploitation' when workers are paid less than the value of their marginal productivity in non-competitive markets. In any case, a critique based on 'inequivalence', or non-competitiveness of wage labour markets, is not even close to a critique of wage labour *per se*, but a call for greater 'equivalence' or competition – which is a constant refrain in neoclassical theory.

In the Abstract, Cartelier also makes the statement, with the idea repeated later in the text, that 'wage-earners are not responsible for the consequences of their activities when they comply with entrepreneurs' orders' (Cartelier, 2017, p. 27). It is a promising beginning, to at least mention the word 'responsible', but there is no hint of the crucial distinction between factual/*de facto* responsibility and legal/*de jure* responsibility. Wage-earners (in a non-criminal activity) have no legal or *de jure* responsibility for the positive and negative results of production (Ellerman, 2016), but they do still have the usual factual or *de facto* responsibility that is the usual basis for juridical imputation.

The concepts of who is *in fact* responsible for a tort or crime, versus who the Law holds *legally responsible,* are not so difficult to understand. For instance, a criminal trial tries to determine if the accused was, in fact, responsible for the crime, and if the court decides that they are, then the legal responsibility is imputed accordingly. Whenever two concepts should match (factual and legal responsibility) there are two ways it can go wrong – like type I and type II errors in statistics. Thus, justice is served if the factually responsible party is held legally responsible, and there is an injustice if the factually responsible party is not held legally responsible, or if the party held legally responsible was not the factually responsible party.

These standard juridical concepts are the conceptual battering-ram to breach the neoclassical fortress using the labour theory of property (not the fallacious 'labour theory of value'), but Cartelier shows no awareness of that whole tradition. Even within the narrowly French tradition, it might be noted that Pierre-Joseph Proudhon's main work was entitled 'What is property?', not 'What is Value?'.

In attempting to respond, Cartelier's message gets even more confused when he says that he is referring to 'economic responsibility' and that '*Inside* the firm, the wage-earner is not economically responsible' (Cartelier, 2017, p. 27, fn. 2). Conventional economics, in the Austrian or neo-classical varieties, eschews the usual notions of factual and legal responsibility since they can only apply to persons – and not to capital goods, land, or other non-human inputs.

> 'If it is the moral imputation that is in question, then certainly no one but the labourer could be named. Land and capital have no merit that they bring forth fruit; they are dead tools in the hand of man; and the man is responsible for the use he makes of them' (Wieser, 1930, p. 79).

Hence the usual juridical notions of responsibility do not serve the social-apologetic role of the 'science of economics' to apologise for wage labour, so those concepts must be ignored in favour of a metaphorical notion of 'economic responsibility' that is identified with marginal productivity, and can be applied to all causally efficacious factors – human or not.

> 'In the division of the return from production, we have to deal similarly... with an imputation, – save that it is from the economic, not the judicial point of view' (Wieser, 1930, p. 76)

In case anyone misses the point, Wieser repeats the point as the header on the next page.

> 'The Economically Responsible Factors' (Wieser, 1930, header on p. 77).

Hence Cartelier perfectly plays into the conventional Austrian/neoclassical story of marginal productivity by saying he is not concerned with the ordinary, juridical notions where 'no one but the labourer could be named', and is only concerned with 'economic responsibility'. As we say, he has 'jumped from the frying pan into the fire'.

Section 1

Section 1 of Cartelier's paper is entitled '"Human labour" does not belong to the commodity space if not with the human beings who perform it'. Cartelier takes the Arrow-Debreu model – which has a whole set of problems of its own (Ellerman, 1993, p. 188) – as the standard of neoclassical thought, which accounts for the over-stylised question of whether or not human labour belongs to the 'commodity space'. Why not just formulate the question as to the legitimacy of the market for wage labour, or the employment contract, or the human-rental relationship, instead of a question of what can or should be represented in an one-dimensional space – the 'commodity space' of the Arrow-Debreu model? Is Cartelier trying to criticise wage labour, or just the Arrow-Debreu model?

Cartelier makes a promising beginning by considering the difference between a person as truck-owner, a truck, and truck-services, bought and sold in the rental market for trucks. In the employment relation, there is the worker as a 'self-owning' person, the worker as the asset (like the truck providing the flow of services), and the person's services that are bought and sold in the rental market for persons. In the case of trucks, there is both the market for the trucks as assets and the market for the flow of truck-services. In the case of humans, if there was a market for the underlying asset, that would be a slave market, which is

assumed to be ruled out in neoclassical economics. Instead of delving deeper into the difference between trucks and persons – focusing on the capacity for imputability or responsibility – Cartelier just falls back on an *obiter dicta:* that if the humans cannot be marketed like trucks, then human services don't fit 'in the commodity space' of the Arrow-Debreu model.

> 'The mere fact that it is generally assumed that there is a choice between *buying* the "truck" in order to get its services or *hiring* the "truck" for a given duration confirms their common presence in the commodity space. What is true for "trucks" should also be true for "workers"' (Cartelier, 2017, p. 29).

Moreover, the neoclassicals are well aware of this peculiar difference between trucks and people. Indeed, in Alfred Marshall's list of the peculiarities of labour, it is the very 'First peculiarity: the worker sells his work, but retains property in himself' (Marshall 1961, p. 560). Recent neoclassical texts make the same point.

> 'The labour market trades a commodity called "hours of labour services". The corresponding price is the hourly wage rate. Rather loosely, we sometimes call this the "price of labour". Strictly speaking, the hourly wage is the rental payment that firms pay to hire an hour of labour. There is no asset price for the durable physical asset called a "worker" because modern societies do not allow slavery, the institution by which firms actually own workers' (Begg et al., 1997, p. 201).

Cartelier goes on to note how the flow of services is inseparable from the underlying asset.

> '"Workers" and "human labour" are *physically* related as are "trucks" and "truck services". … Mainstream economists not only ignore slavery, but they also expel "workers" from the commodity space, pretending nevertheless to keep "human labour" as an element of it. By virtue of the *physical bind* alluded to above, expelling "workers" means expelling "human labour" as well' (Cartelier, 2017, pp. 29-30).

Again Cartelier supplies no argument for his *obiter dicta* that 'expelling "workers" means expelling "human labour" as well' from the commodity space. Indeed, Cartelier has just discovered Marshall's "Second peculiarity. The seller of labour must deliver it himself" (Marshall, 1961, p. 566). I am afraid it takes a lot more than a few such *obiter dicta* to breach the fortress of neoclassical apologia.

Section 2

Section 2, entitled 'The Wage Relationship is a Monetary Subordination; Means of Payment Circulation Makes it Clear', tries to develop a somewhat bizarre monetary argument against wage labour. Cartelier argues that, in some sense (never explained), entrepreneurs, or firms in general, have access to a 'minting process' and since wage-earners do not have such access, the wage relationship is characterised by 'monetary subordination'. Since I cannot make sense out of any such 'minting process', I must pass over that part of the argument.

It is, however, a common critique of wage labour, particularly on the basis of civic republican thought, that it involves subordination or domination ('monetary' or otherwise). It is hardly a revelation to conventional economists that the employer-employee relation, traditionally called the master-servant relation, involves subordination. The standard response is: 'Of course, it does; that's one of the reasons employees are *paid* for their work.' They acknowledge that undoubted subordination adds to the disutility of labour, and that such unpleasantness may account for part of the compensating wage payment. Like in any resource-supply contracts, the original resource owners are free to try to renegotiate the contract, go elsewhere to sell their resources, or to use the resources for their own uses. Thus, throwing in the word 'subordination' does not really get anywhere for the would-be critic of neoclassical economics.

In fact, the neoclassicals do not argue that being a wage-labourer, particularly in its blue-collar form, is a desirable position in society. Of course, one might desire some form of non-subordinated work, such as being a family farmer, shop-keeper, or independent producer – if not an entrepreneur or employer who could use the voluntary human rental contract to legally appropriate the positive and negative fruits of the labour of the rented people. In the end, the neoclassicals only argue that there are no normative grounds to *outlaw* 'capitalist acts between consenting adults' (to use Nozick's phrase) such as the voluntary human rental contract.

At least Cartelier does not indulge in the shallow, left-wing parlour-game of just escalating one's own definition of 'involuntariness' or 'coercion', so that all – or most – wage-labour is, by definition, 'involuntary.' For instance, it is argued that most workers are not born with access to any means of production (remember the warhorse examples: clearance of the Scottish Highlands and enclosure of the commons) so that they cannot be independent producers, and thus they are 'forced' into wage labour contracts. One might similarly argue that most city-dwellers are not born with access to any means of consumption (unlike those born on a family farm) so they are 'forced' into market contracts with grocery stores or supermarkets in order to survive. Indeed, collectively-bargained, human-rental contracts would seem more voluntary than the take-it-or-leave-it contracts of adhesion between the consumer and supermarkets.

Later in the section, Cartelier points out that human labour is represented as a cost in firms, and contrasts that with an 'exchange economy' (apparently of independent producers with no wage labour).

> *'That some human beings – wage-earners – appear to be (and are) a cost for others (firms and entrepreneurs) is the most significant and specific characteristic of a market economy when embedded in a wage relationship. This is probably the essential feature which distinguishes a market economy from an exchange economy – where everybody is in a symmetric position* vis-à-vis *anybody else'* (Cartelier, 2017, p. 33, italics in original).

Yes, human services, like all input services, are a cost item in a wage-labour firm – which only restates that fact that they are purchased as an input by the employer-firm in the wage-relationship – in contrast to being independent producers. I am afraid that the neoclassicals will find the discovery that independent producers are rather different from wage labourers as rather underwhelming.

Cartelier also, oddly, takes Ronald Coase's well-known idea of the firm as the 'legal relationship normally called that of "master and servant" or "employer and employee"' (Coase, 1937, p. 403) as if that were definitive of *firms* as opposed to *markets*. But, here again, there

is no recognition of firms such as worker cooperatives or democratic firms (Ellerman, 1990) where there is still hierarchy but it is based on a delegation ('*concessio*') of authority in the cooperative membership contract, as opposed to the alienation ('*translatio*') of decision-making rights in the employment contract (Ellerman, 2010).

Cartelier seems as unaware as the neoclassicals of the whole tradition of democratic political theory where the fundamental division is *not* whether or not government is based on the consent of the governed, but whether the consent is to a contract of *alienation* (traditionally called the *pactum subjectionis,* wherein the citizen explicitly or implicitly voluntarily agrees to be a subject) or to a contract of *delegation,* where the governors/managers only exercise authority delegated to them by the governed/managed (see, Gierke, 1966; Skinner, 1978). All the functionaries in the Church of Neoclassical Economists are required by their 'sacred professional obligations' to be blissfully unaware of *that* democratic theory since their most basic defence of the institution of renting of human beings is the fact that it is voluntary – and since even the most slavish of the intellectual 'Hirelings of the [neoclassical] Church' (Milton, 1957[1659]) would not try to argue that the employer was the delegate, representative, or trustee of the employees.

Of course, understanding the distinction between on the one hand contracts of person-alienation – such as:

- the outlawed, voluntary-self-sale contract,
- the outlawed, voluntary Hobbesian *pactum subjectionis*,
- the outlawed, voluntary coverture marriage, and
- the not-yet-outlawed, voluntary human rental or employment contract

and on the other hand, contracts of delegation – does not yet 'seal the deal'. That requires an analysis showing that there is something inherently wrong with those person-alienation contracts. And that requires recovering the largely forgotten, or ignored, theory of inalienable rights (Ellerman, 2010; 2015) that descends from the Reformation doctrine of the inalienability of conscience – down through the Enlightenment (e.g., in the Scottish, Dutch, and German variants) – to the present day, in the abolitionist, democratic and feminist movements.

Perhaps it would help to understand this inalienability critique of the employment contract by considering the analogous feminist analysis of the coverture marriage contract which is now outlawed in democratic countries (as opposed, say, to Saudi Arabia). Normally, to establish a legal guardian relationship of one adult (as guardian) over another (as dependent), there must be some *factual* condition on the part of the dependent, such as some mental disability or senility, that needs to be certified.

Yet the coverture marriage contract established the husband as the 'Lord and Baron' or, in less flowery language, guardian over the *femme covert,* who had no independent legal personality and, thus, could not make contracts or own property except in the name of the husband. In an adult woman of normal capacity, that factual capacity is factually inalienable – in the sense that the woman cannot, by voluntary agreement, actually alienate that capacity – and factually become a person of diminished capacity, i.e. a dependent, suitable for a guardianship relation. Yet the coverture contract gave her precisely that legal position (once again, the point is this contrast between the factual and the legal situation). Since the woman is just as much a *de facto* capacitated adult as before voluntarily agreeing to the contract, the coverture contract was essentially an institutional fraud, sponsored by the legal system in patriarchal society, that allowed the reduction of married women to the status of legal dependents to parade in the form of a legal contract.

The critique of the human rental or employment contract is entirely analogous using the usual notions of factual and legal responsibility as applied to the appropriation of the liabilities and assets created in production. The legal authorities are fully aware that an employee who commits a crime at the command of the employer is jointly factually responsible for the crime, and the legal responsibility is imputed accordingly.

> 'All who participate in a crime with a guilty intent are liable to punishment. A master and servant who so participate in a crime are liable criminally, not because they are master and servant, but because they jointly carried out a criminal venture and are both criminous' (Batt, 1967. p. 612).

Unless one wants to argue that employees suddenly become robots, or some sort of non-responsible instruments, to be 'employed' by the 'employer' when the venture 'they jointly carried out' was 'non-criminous', then the employees (and working employer) in an enterprise are jointly, factually responsible for using up the inputs (i.e., creating the input-liabilities) and producing the products (i.e., the output assets) that make up the negative and positive components in the usual 'production vector' representing the results in a productive opportunity.

Thus, by the usual juridical norm of imputation, they should jointly have the legal liabilities for using up the inputs and the legal ownership of the produced outputs. Yet, the employees, *qua* employees, have 0% of the input-liabilities charged against them and 0% of the produced outputs owned by them – which is exactly the legal role of a rented, non-responsible instrument. The employer, typically a corporation, holds 100% of the input-liabilities and owns 100% of the produced outputs. Yet the employees are as inextricably and inalienably co-responsible (in factual terms) – as in the case of the criminal venture. The employees cannot, by any voluntary act, turn themselves into *de facto* non-responsible instruments, just as the married woman cannot voluntarily alienate her adult capacity to become a *de facto* dependent. The whole contract to rent human beings is another institutional fraud, legally sponsored by a society based on renting (instead of owning) other humans, so that the positive and negative fruits of the rented people can be appropriated by the employer. But, unlike the coverture marriage contract, the human rental contract is still legally valid.

Section 3

In Section 3, entitled 'Exploitation of Wage-earners by Entrepreneurs is Inherent in the Wage Relationship', Cartelier first sets aside the exploitation theories, based on some norms of wage payment – such as marginal productivity in the neoclassical case of non-competitive payments, or such as labour-value expended in the Marxist case. This is another promising beginning, since exploitation theories based on the charge that 'wages are too damned low' (by whatever account) are not a critique of wage labour *per se*. Cartelier also applies a few blows to the long-dead horse of the Marxian labour theory of value and exploitation, but that is overkill, since the Marxian theory is, at best, only a theory that labour 'is paid below its value'.

> 'It will be seen later that the labour expended during the so-called normal day
> is paid below its value, so that the overtime is simply a capitalist trick to extort
> more surplus labour. In any case, this would remain true of overtime even if

the labour-power expended during the normal working day were paid for at its
full value' (Marx, 1977, p. 357, fn. or Chap. 10, Sec. 3).

Cartelier goes on to point out a couple of obvious differences between entrepreneurs or
independent producers on the one hand, and wage-earners on the other hand – and then
again simply asserts: 'In this double difference lies exploitation' (Cartelier, 2017, p. 35).

Cartelier is on seemingly more promising ground by referring to Marc Fleurbaey's
notion of:

> 'the exploitation inherent in the wage relationship is the one he calls
> *M-exploitation*: any human being utilised by another human being *as a means*
> oriented to his/her own ends' (Cartelier, 2017, p. 35).

Perhaps we have here some substance – at least in the phraseology, reminiscent of one form
of Kant's categorical imperative:

> 'Act in such a way that you always treat humanity, whether in your own
> person or in the person of any other, never simply as a means, but always at
> the same time as an end' (Kant, 1964, p. 96).

Perhaps Cartelier and Fleurbaey will tap into the neo-Kantian tradition of the Marburg School
(Keck, 1977; Linden, 1988; Ellerman, 1988) that developed ethical theories for a non-
capitalist or 'socialist' economy. But that expectation is severely disappointed as Fleurbaey
points out that in all market relationships, one party uses the other as a means to one's own
ends since:

> 'in standard economic models of trade and strategic interaction, one can think
> that each agent sees the other agents as means to the pursuit of his own
> objectives' (Fleurbaey, 2014, p. 662).

After all, as Adam Smith famously pointed out: 'It is not from the benevolence of the butcher,
the brewer, or the baker, that we expect our dinner, but from their regard to their own self
interest' – and the market relationship between the consumer and the butcher, brewer, or
baker does not involve wage labour.

Fleurbaey does not seek any deeper sense in which the renting of human beings
might be seen as treating 'persons' as 'things'. Indeed, Fleurbaey's own development of
'M-exploitation' has no particular relationship to wage labour at all. It is a species of any
'situation in which some take an unfair advantage at the expense of others' (Fleurbaey, 2014,
p. 655). In this case, of M-exploitation, one party may own a resource, like a mine, that has
unknown or unexpected mineral resources – and then sell it at a low price to another party,
who would thus take 'unfair advantage' of the original, benighted resource owner 'when the
reserves prove to be greater than expected' (Fleurbaey, 2014, p. 662).

In addition to being utterly trite, this sort of 'normative' analysis unsurprisingly has
nothing in particular to do with the institution of the voluntarily renting of human beings – and,
thus, is typical of what one finds in the 'better' neoclassical literature on 'normative
economics' and 'social welfare analysis'.

References

Batt, F. (1967) *The Law of Master and Servant* (5th ed.). London: Pitman.

Begg, D., S. Fischer and R. Dornbusch (1997) *Economics* (5th ed.). London: McGraw-Hill.

Coase, R. H. (1937) 'The Nature of the Firm.' *Economica* IV (Nov.), pp. 386–405.

Cartelier, J. (2017) 'About Waged Labour: from Monetary Subordination to Exploitation.' *Economic Thought*, 6.2, pp. 27-36. http://www.worldeconomicsassociation.org/files/journals/economicthought/WEA-ET-6-2-Cartelier.pdf

Ellerman, D. (1988) 'The Kantian person/thing principle in political economy.' *Journal of Economic Issues,* 22 (4), pp. 1109–22.

Ellerman, D. (1990) *The Democratic Worker-Owned Firm.* London: Unwin-Hyman Academic.

Ellerman, D. (1993) *Property & Contract in Economics: The Case for Economic Democracy.* Cambridge, MA: Blackwell.

Ellerman, D. (2005) 'Translatio versus concessio: retrieving the debate about contracts of alienation with an application to today's employment contract.' *Politics & Society,* 33, pp. 449–80.

Ellerman, D. (2010) 'Inalienable rights: a litmus test for liberal theories of justice.' *Law and Philosophy,* 29 (5 September), pp. 571–99.

Ellerman, D. (2015) 'On the renting of persons: the neo-abolitionist case against today's peculiar institution.' E*conomic Thought* 4 (1), pp. 1–20. http://et.worldeconomicsassociation.org/files/WEA-ET-4-1-Ellerman.pdf

Ellerman, D. (2016) 'The labour theory of property and marginal productivity theory.' *Economic Thought* 5 (1), pp. 19–36. http://et.worldeconomicsassociation.org/files/WEA-ET-5-1-Ellerman.pdf

Fleurbaey M. (2014) 'The facets of exploitation.' *Journal of Theoretical Politics*, 26 (4), pp. 653-76.

Gierke, O. von (1966) *The Development of Political Theory* (trans. B. Freyd). New York: Howard Fertig.

Kant, I. (1964) *Groundwork of the Metaphysic of Morals* (trans. H. J. Paton). New York: Harper Torchbooks.

Keck, T. R. (1977) 'The Marburg School and ethical socialism: another look.' *The Social Science Journal,* 14 (3 Oct.), pp. 105–19.

Linden, H. van der. (1988) *Kantian Ethics and Socialism.* Indianapolis: Hackett.

Marshall, A. (1961) *Principles of Economics* (9th (variorum) edition). London: MacMillan.

Marx, K. (1977[1867]) *Capital (Volume I)* (trans. B. Fowkes). New York: Vintage Books.

Milton, Jn. (1957 [1659]) 'To remove hirelings out of the church.' In *John Milton: Complete Poems and Major Prose*, M. Hughes (ed.), pp. 856–79. New York: Odyssey Press.

Skinner, Q. (1978) *The Foundations of Modern Political Thought: Volumes I and II.* Cambridge: Cambridge University Press.

Wieser, F. von (1930 [1889]) *Natural Value* (trans. by C. A. Malloch). New York: G.E. Stechert and Company.

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Is Cartelier's Monetary Approach a Convincing Alternative to the Labour Theory of Value? A Comment

Stavros Mavroudeas, Department of Economics, University of Macedonia, Thessaloniki, Greece
smavro@uom.edu.gr

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1. Introduction

Jean Cartelier's paper follows in the steps of his long-standing previous work (e.g. Cartelier, 1991; Benetti and Cartelier, 1999) of advancing a monetary approach as an alternative to the theory of value. This approach originated with what was then branded as the 'Rubin School' (e.g. Cartelier, 1976; Deleplace, 1979; Benetti and Cartelier, 1980), that offered a monetary interpretation of Marx's theory of value (more on this issue below). This approach began as an internal criticism of Marx's theory of value and an attempt to reinstate it in more consistent terms; that is, to offer a better theory of value based on money. It evolved from a completely different approach from that of Marx's (owing more to Schumpeter and, probably, to Keynes) that rejected altogether the concept of value. This paper belongs to the second breed, that is, it rejects completely the theory of value and proposes a fully-blown monetary approach.

My comment offers a critique of Cartelier's monetary approach and a defence of the Marxist labour theory of value. The next section briefly presents and criticises the 'Rubin School', the ancestor of the monetary approach, as many of the problems of the latter existed already in the former. The third section analyses and criticises Cartelier's monetary approach as such. Finally, the last section concludes.

2. The 'Rubin School' and its Shortcomings

In the 1970s, Marxist economic analysis came under fire from the then emerging neo-Ricardian tradition propagated by Steedman (1977). The latter was based on the seminal work by Sraffa (1960), whose aim, however, was not a critique of Marxist political economy, but a critique of the internal consistency of general equilibrium neoclassical economics. The neo-Ricardian tradition argued that you can derive a theory of prices without a theory of (labour) values by simply studying the physical and technical inputs of production (in practical terms, through input–output analysis). This argument discarded not only the Marxist, but also the Ricardian, conception that prices (in the ultimate form as monetary prices) are determined by labour values (that is the expenditure of labour in production – in practical terms, labour-time). Thus, for neo-Ricardians, labour value is redundant. It can only be useful as a side dish on the menu, as an explanation of the exploitation of labour by capital.

The neo-Ricardian challenge was vigorously repelled by the Marxist tradition in the ensuing Value Debate of the 1970s and 1980s (see Fine, 1986). It was convincingly shown that neo-Ricardianism is a technicist approach that cannot grasp the social dimension of capitalism (a central element in both classical – primarily Ricardian – and Marxist political economy). Moreover, the Marxist reply proved both the internal consistency of Marx's analysis and its explanatory superiority. It also showed that, while the Marxian labour theory

of value (LTV) was close to the Ricardian one (in defining values as expenditure of labour in production), it differed radically in how these labour values are defined. Thus, Ricardo's LTV was based on embodied labour (a conception of labour focusing on its technical characteristics), whereas Marx's LTV was based on abstract labour (i.e., a conception of labour focusing not only on its technical but also on its social characteristics).

The so-called 'Rubin School' (e.g. Cartelier, 1976), was part of this reaction to neo-Ricardian technicism, but chose a path that subsequently led it astray (see Mavroudeas, 2004; 2012). It attempted to elaborate an abstract labour value theory by emphasising the social dimension. However, it erroneously posited money as the immediate (i.e., without the mediation of intermediate stages) incarnation of the social dimension. Thus, value was totally divorced from the sphere of production and was relegated to the sphere of circulation: value is created in the exchange of commodities for money. It should be noted that the Marxian transformation process of (labour) values to (ultimately monetary) prices is much more sophisticated and, by the way, more realistic. For Marxist economic analysis, values are created in the sphere of production (through a normalisation process involving both technical and social characteristics) as labour-time magnitudes. They are then transformed in the sphere of circulation, taking into account the long-run dimensions of intra-capitalist competition (i.e., productive structure expressed in differing organic compositions of capital), to prices of production. And, finally, they are transformed again in the sphere of circulation, also taking into account the short-run dimension (i.e., the fluctuations of supply and demand) to market prices (which are the prices observed in practice). The latter are, in a fully-developed capitalist economy (in which commodification is dominant and, thus, monetisation is also dominant as opposed to barter), monetary prices. However, the formation of values does not require, in its essence, the intermediation of money – but can exist in the form of barter (e.g. in the primitive steps of capitalism). In this sense, Marx (in *Capital Volume I*) employs value theory in order to analyse production, while abstracting from exchange and distribution. Of course, and this was forcefully explained by Marx, a fully-developed capitalist economy is a monetary economy (i.e., not only is commodification dominant, but also commodity exchange is mediated by money).

The 'Rubin school' approach of Benetti and Cartelier failed to acknowledge this sophisticated and layered process of determination. By directly equating value with money it ended up in 'circulationism' (that is, the undermining of the primacy of the sphere of production within the total circuit of capital). Hence, they ended up arguing that values and prices are 'incommensurable' factors, and attacked Marx for attempting to establish equations of the type 'sum of prices equals sum of values'. They additionally accused Marx of adopting a Ricardian theory of labour value. The necessary consequence of the 'Rubin school' perspective is the ultimate abandonment of value theory: (labour) value is discarded and money is posited as the sole concept of the economic analysis of capitalism. Curiously enough, the 'Rubin school' concluded with a very similar result as its neo-Ricardian opponent: value is redundant.

Before closing this section it is necessary to point out that the identification of the 'Rubin school' (and of other similar approaches that also directly equate value with money) with the seminal works of I. I. Rubin (1973; 1978) is totally unwarranted. Rubin disagreed completely with the direct identification of value with money. In many places he affirmed that value can be studied without having previously established money (Rubin, 1978, p. 36). Additionally, he explicitly condemned the view that value is created in circulation, stating that 'abstract labour and value are created or "come about", "become" in the process of direct production … and are only realised in the process of exchange' (Rubin, 1978, p. 125). Finally,

referring to the quantitative determination of abstract labour, Rubin said that it is a misunderstanding,

> 'to admit that the social equalization of labour in the process of exchange is carried out in isolation of dependence on production (for example, the length, intensity, length of training for a given level of qualification, and so on), and thus, the social equalization would lack any regularity since it would be exclusively determined by market spontaneity' Rubin (1973, p. 154).

3. The Monetary Approach: a Problematic Theory of Wage

Cartelier's paper follows in the steps of the previous 'Rubin school' analysis and it is an exemplary case of his monetary approach. Value analysis is dropped altogether and all major functions of capitalism revolve around money.

Cartelier sets out to confront both mainstream (that is, nowadays, neoclassical) and Marxist theories of wage. He argues that capitalism is based on the wage relationship (i.e., the hiring of workers by capitalists) that exhibits the following 'stylised facts':

> 'wage-earners voluntarily accept to work under the control of the entrepreneur; they do not decide what, how and how much they have to produce but they comply with entrepreneur's orders inside the firm as subordinates; outside the firm the wage-earners freely choose how to spend their wages.'

Then he argues that every realistic and consistent wage theory – in accordance with the abovementioned 'stylised facts' – should be able to:

> (a) define the qualitative differences between a simple market economy (in Marxist terminology, a simple commodity production economy; that is a fictional and historically non-existent type of economy comprised of independent producers that work themselves and do not employ others and exchange their product in the market) and a capitalist economy (again in Marxist terminology, a capitalist commodity production economy; that is one comprised of capitalists and workers where the latter work for the former); and

> (b) explain how workers are being exploited in capitalism.

In the following sections we shall tackle firstly, the wage relationship and secondly, the solutions to the two challenges above.

The Wage Relationship

To begin with the wage relationship (later inherited by the Regulation Approach (Aglietta, 1979) is a poor substitute for the Marxian LTV. The stylised facts that Cartelier presents are clearly stated in the relevant chapters of Marx's *Capital*. Marx was the first to point out the indeterminacy of the employment contract (which is now widely accepted within legal studies). More precisely, he showed that what is sold in the labour market is not the product of labour, but its ability to produce (more specifically the time to use) labour-power. This difference

between labour-power and its output (the application of labour-power in the labour process) is the basis of the indeterminacy of the employment contract. This contract defines very accurately (a) the amount of labour-power sold (that is the time which the worker offers to work for the capitalist and under his direction) and (b) its reward (the wage rate). However, it does not define the result of the application of the ability to work (the labour expended), that is the output of its application in the capitalist production process. The latter depends primarily on the capitalist, who has the managerial prerogative (i.e., the right to direct the labour process and thus the expenditure of labour – types of work, intensity etc.). Thus, the employment contract does not define a series of crucial parameters (e.g. the specific work tasks, the intensity of work) that affect the output of the labour-process.

Following from these considerations, Marx argues that what is being sold in the labour-market is not the actual labour performed (and its output), but a certain length of period of ability to work. Thus, it is not labour that is the commodity sold in the labour-market, but labour-power. The latter is a *sui generis* commodity because it is not produced in a factory, but in the family, outside the control of the capitalist. It has a value (as has every commodity), which is the socially-necessary labour-time required for its reproduction. However, because it is privately reproduced – outside capitalist production *per se* – its socially-necessary labour-time is the time required for the production of the means of consumption necessary for its reproduction (which are bought in the market). As with every commodity, the value of labour-power is reflected in a price, which is the wage. The flow of value created by the application of labour-power (that is the output of the production process) must be higher than its value; or else the capitalist cannot get surplus-value (and thus a profit) and will become bankrupt. The fact that the capitalist has the managerial prerogative enables him to extract this surplus-value (which is an amount of unpaid labour-time). In this manner, Marx combines the analysis of labour-time (paid and unpaid), with the stocks and flows of commodities (means of consumption, output) and their monetary denomination (wages, profits) in a sophisticated, structured and realistic theory of wage (see Mavroudeas, 2001).

Cartelier (1991) rejects this theory by arguing, unconvincingly, that the Marxian theory of exploitation relies on two elements (respectively the labour theory of value and labour-power as a commodity) which are both inconsistent with Marx's commodity theory. He rejects the Marxian labour theory of value on the basis of an erroneous understanding of Marx's value-form analysis and a reiteration of trivial and arguments about values not determining prices which have been answered long ago (see Fine, 1986). And he also rejects the commodity nature of the value of labour-power because it does not satisfy the condition put forth by Marx 'to be privately and independently produced' (see Cartelier, 1991). This thesis falls prey to the typical neoclassical argument (pioneered by Samuelson, 1982) that seeks to invalidate the labour theory of value and dethrone labour from its position as the sole active creator of wealth, and thus reject the notion of exploitation in capitalism. This argument has also been convincingly rejected on both analytical and empirical grounds (see Mavroudeas, 2001) and the special commodity nature of labour-power defended.

Cartelier's monetary approach to the wage relationship is a poor substitute for Marx's analysis. By dropping value theory, he attempts to define the indirect obligation of the labourer to sell his ability to work to the capitalist by his lack of access to the 'minting process' (sic). He argues that when only a fraction of human beings have access to the minting process, this generates a difference of condition. Those people who have no access to the minting process cannot intervene directly in the market, which means that they are not able to run an independent process of specialisation. Hence, they are obliged to work for those having access to the mint in order to acquire money. In formal terms, Cartelier drops labour-time and commodity analysis (see also below, on the issue of Simple and Capitalist

Commodity Production) and goes directly to monetary variables in a very simplistic manner. He argues that economic relations are payments (Cartelier, 2017 p. 31). This is a very problematic definition because it does not take into account the sphere of production and the struggle within it (when even Coase admits that the factory is not a market). Then Cartelier argues that individuals are simply accounts into which payments write down quantities of money (Cartelier, 2017 p. 31). What can differentiate the mass of individuals into different groups (social classes?) is the differential access to the mint: those that have it (the haves) are in a superior position than those that do not (the have-nots). This is also a very weak explanation for the appearance of class diversification in capitalism. It is even weaker than Smith's simplistic reference to the emergence of capitalists as those who, for some mysterious reason, have acquired wealth and thus cease to work and choose to employ others to work for them. Why does a group of people gain preferential access to the mint? Cartelier offers no serious explanation. Is it because of some mysterious inheritance (in which case it is an example of Proudhonist labour-theory-of-property inanity, rightfully ridiculed by Marx)? Or is there some form of institutional prohibition (which Cartelier does not explain)? In any case, these explanations do not fit the empirical data on how capitalism was constructed. It was not through some form of differential access to the mint (after all, it was only the kings that had such access) but through trade and manufacture. Last but not least, what happens when the have-nots work for the haves and themselves become units of account (sic!)? Then is this difference of condition perpetuated? The argument that 'entrepreneurs and independent producers master the two elements of their budgetary constraint, while wage-earners master only their expenditures' (Cartelier, 2017, p. 35) is unrealistic, as it is well known that workers struggle over the wage rate.

In conclusion, Cartelier's monetary approach to the wage relationship cannot explain the way capitalism was born. Moreover, it totally neglects to explain how capitalism functions in the sphere of production. It also fails to offer a convincing theory of wage determination, as it cannot grasp workers' struggle over both pay and working conditions.

Simple and Capitalist Commodity Production

The first challenge (to define the qualitative differences between a simple market economy and a capitalist economy), which is trivial, and obviously solved in Marxist analysis, is necessary because Cartelier lumps together all theories referring to value. Thus, he implicitly equates neoclassical general equilibrium theories (of the Arrow and Debreu type) with Marxist analysis – simply because the former makes some fleeting reference to value. However, this neglects the unbridgeable divide between these two theoretical breeds. Neoclassical general equilibrium theories derive, of course, from the subjective theories of value (that is, theories that identify value with [subjective] utility) from the forefathers of neoclassicism, but have long ago (at least since the completion of their supply and demand analysis) ceased to make any reference to value (see Gramm, 1988). On the contrary, Marxism adheres to the objective theories of value (populated mainly by labour theories of value).

The reason why Cartelier makes this unwarranted bundling together is that they both emphasise the role of commodities in capitalism, and Cartelier's monetary approach downgrades the commodity aspect in favour of the monetary dimension. In this, Cartelier foregoes another major difference between them. For neoclassical general equilibrium theories, commodities do not have any social dimension. They adhere to the theory of productive factors – that is, the capitalist economy consists of very different individual agents (hence there are no social classes, in the economy at least) – that, curiously enough, exhibit the same max-min behaviour (maximising utility and minimising costs). They all produce

and/or possess commodities. Moreover, the production process (to the limited extent that neoclassicism analyses it through microeconomics) is in practice composed, not of people but of commodities (capital, labour, land etc.). For this reason, it has been rightfully criticised by Marxism as a commodity-fetishist economic analysis. On the contrary, Marxism adheres to a theory of productive forces, that is, (a) capitalism consists of competing social classes (fundamentally capital and labour) with different economic behaviours and (b) labour is the sole active creator of wealth. Commodities are the products of labour; that is, they are the outcome of a social process. For this reason, capital and labour have different meanings in Marxism and neoclassicism. From this follows another major difference in their analysis: for Marxism it is labour-time that produces commodities, whereas for neoclassicism commodities are the outcome of the combination of various, equally important, factors. Consequently, for Marxism, commodity analysis must necessarily be geared to the analysis of labour-time (whereas neoclassicism does not pay attention to this). Concluding, lumping together Marxism and neoclassicism as similarly infatuated with the commodity is simplistic and erroneous.

Given the abovementioned considerations, for Marxism, the difference between a fictitious, simple commodity production economy, and a capitalist commodity economy is a non-problem. In the former, the Law of Value (the determination of prices by values) operates unequivocally (i.e., prices coincide with values), whereas in the latter, the operation of the Law of Value has to pass through several mediating stages and exhibits degrees of freedom (i.e., prices fluctuate around values). Notwithstanding, Cartelier foregoes these crucial differences and attempts to define the differences between simple and capitalist commodity production by essentially dropping the commodity dimension and by resorting directly to monetary variables. In this he fails, both to offer a superior alternative to Marxist analysis, and to accurately criticise neoclassical economics.

We referred to Cartelier's problems *vis-à-vis* the Marxist analysis above. However, Cartelier also fails to criticise neoclassicism effectively. His argument – that because neoclassicism accepts that labour is a commodity, then a general equilibrium cannot be obtained – is simply nonsensical. He accuses neoclassicism of inconsistency because it conceives the labour-market as an exchange of equivalents, and the wage as simply another commodity ('human labour or labour-power') whose magnitude is determined like all other commodities. He argues that this cannot explain how a contract among equals results in the hierarchical relationship lucidly presented in Marx's excerpt.

His criticism of neoclassicism is inaccurate and beats around the bush because Cartelier does not grasp correctly how neoclassicism understands the productive factor 'labour' (see sub-section above). In its simplest and more fundamental form, the neoclassical theory of wages states that the price of labour (i.e., the wage rate) is determined by the interaction of demand and supply of labour in the market. Labour demand is determined according to the marginal product of labour. This slopes downward because of the neoclassical assumption of diminishing marginal returns. Perfect competition prevails in the product market and in the labour market. Perfect competition in the product market implies that products are homogeneous and the price of the goods is given for all firms in the market. Perfect competition in the labour market also implies that labour, as well as firms, behave as 'wage-takers'; no one can influence the wage rate. Consequently, the labour supply curve is perfectly elastic. Since the wage rate does not change, the labour supply curve becomes the average cost curve of labour and it coincides with the marginal cost curve of labour. The equilibrium wage rate is set at the point where labour demand equals labour supply. From this it follows that the labour market is an exchange of equivalents; there is no exploitation as each productive factor (capital and labour) is paid according to its contribution. There is no

logical flaw in the neoclassical analysis, unless you question its definitions of capital and labour (and hence its theory of productive factors) and its very stringent and unrealistic assumptions (e.g. perfect competition).

The Issue of Exploitation: Marx or Fleurbaey?

Cartelier's second challenge (to explain how workers are being exploited in capitalism) also emerges because he rejects the Marxist theory of exploitation (that is the theory of surplus-value). This theory is an elaborate construction combining labour-time, commodity and monetary variables. Above all, it has a very good fit in actual reality as it can grasp all the dimensions of the struggle between labour and capital (labour-time and intensity, income distribution etc.).

Cartelier aims to show that capitalism is a system of exploitation of the wage-earners by the entrepreneurs (which are more lax substitutes for workers and capitalists). In order to achieve this, he employs Fleurbaey's peculiar definition of M-exploitation: any human being is exploited when he is being utilised by another human being as a means oriented to the latter's ends. Then he argues that the have-nots (with no access to the mint) are being exploited by the haves and this exploitation takes place in production (as the former have to work under the direction of the latter). Thus, the wage relationship is a form of monetary subordination.

Compared to the supposedly failed Marxian theory of surplus-value, Fleurbayey's M-exploitation is a poor substitute. The first is an economic theory (based on a more general theory of surplus expropriation). The second is a triviality so general that is has no serious explanatory power. M-exploitation can be attributed to almost any field of human interaction (e.g. sentimental issues). Furthermore, it can be used either in a methodologically individualist framework, or in a social class framework. This generality does not increase, but rather decreases, its explanatory ability. Its application in economic relations by the monetary approach to the wage determination is tantamount to this. How can such a theory explain with precision class struggle over pay and working conditions? How can it explain (particularly in its monetary form) intricate matters such as struggle over productive tasks and job descriptions?

4. In Place of Conclusions

We have argued that Cartelier's monetary approach to wage determination is a problematic wage theory. It cannot explain the struggle between labour and capital in the production process on issues like industrial relations, intensity of work, productive tasks and job descriptions, etc. It cannot even satisfactorily account for issues concerning income distribution, as these involve a combination of labour-time, commodity and monetary variables and the monetary approach is only restricted to the last of these.

On top of that, the monetary approach seems to have two other major deficiencies. The first deficiency concerns its methodology. It obviously rejects Marxist dialectical materialism and its elaborate and layered structure of abstraction. However, in place of this accursed 'violence of abstraction' it does not have anything more satisfactory to offer apart from a mere recourse to the phenomenology of monetary circulation.

The second deficiency concerns its theory of money. For a monetary approach it seems to have a very primitive and unsatisfactory theory of money. The equation of the financial system with 'the mint' is, to say the least, very weak. The derivation of money, the

role of the state, forms of money (e.g. world money), capital markets and banking, let alone more complicated issues (for example, credit and fictitious capital) are totally absent.

In toto, Cartelier's recourse to Schumpeter (and Keynes) is an inadequate alternative to Marx.

References

Aglietta M. (1979) *A Theory of Capitalist Regulation*. London: New Left Books.

Benetti C. and Cartelier J. (1980) *Marchands, Salaries et Capitalists*. Grenoble: Maspero.

Benetti C. and Cartelier J. (1999) 'Market and division of labour: a critical reformulation of Marx's view'. *Rivista di Politica Economica*, vol. 89 no. 4/5.

Cartelier, J. (1976) *Surproduit et reproduction sociale*. Grenoble: Maspero

Cartelier, J. (1991) 'Marx's theory of value, exchange and surplus-value: a suggested reformulation'. *Cambridge Journal of Economics*, vol. 15, no.3, pp. 257-69.

Cartelier, J. (2017) 'About Waged Labour: from Monetary Subordination to Exploitation.' *Economic Thought*, 6.2, pp. 27-36. http://www.worldeconomicsassociation.org/files/journals/economicthought/WEA-ET-6-2-Cartelier.pdf

Deleplace, G. (1979) *Theories du Capitalism*. Grenoble: Maspero.

Fine B. (1986) *The Value Dimension*. London: Routledge.

Gramm, W. (1988), 'The movement from real to abstract value theory, 1817-1959', *Cambridge Journal of Economics,* vol.12, no.2, pp. 225-46.

Marx K. (1979), *Capital Vol. I*. Moscow: Progress Publishers. https://www.marxists.org/archive/marx/works/download/pdf/Capital-Volume-I.pdf

Mavroudeas, S. (2001) 'The monetary equivalent of labour and certain issues regarding money and the value of labour-power'. *Economie Appliquee*, tome LIV, no.1.

Mavroudeas, S. (2004) 'Forms of existence of abstract labour and value-form.' In Freeman A.-Kliman A. and Wells J. (eds) (2004) *The New Value Controversy: The Foundations of Economics.* Cheltenham: Edward Elgar.

Mavroudeas, S. (2012) *The Limits of Regulation: A Critical Analysis of Capitalist Development*. Cheltenham: Edward Elgar.

Rubin, I. I. (1973) *Essays on Marx's Theory of Value*. Montreal: Black & Rose.

Rubin, I. I. (1978) 'Abstract labour and value in Marx's system'. *Capital & Class*, no.5.

Samuelson, P. (1982) 'The normative and positive inferiority of Marx's value paradigm'. *Southern Economic Journal,* vol.49. no.1.

Sraffa, P. (1960) *Production of Commodities by Means of Commodities: Prelude to a Critique of Economic Theory*. Cambridge: Cambridge University Press.

Steedman, I. (1977) *Marx after Sraffa*. London: New Left Books.

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