

'Reflections upon *Neoclassical* Labour Economics'

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Introduction¹

Whilst Lawson (2013) explores possible meanings of the term 'neoclassical', primarily, via the work of Veblen (who first coined the term), the lessons Lawson offers extend not only beyond the history of economic thought, but also beyond the meaning of the term 'neoclassical'. The main lesson, as I read it, is Lawson's insistence on locating the discussion *not* at the level of *substantive* theory, but at the level of *meta-theory*. Attempts to label this or that substantive theory 'neoclassical' are problematic (a) because it encourages critics to identify limitations solely at the level of *substantive* theory; and (b) because it encourages critics to dismiss substantive theories without attending to the more fundamental meta-theoretical nature of their limitations. So, for example, some economists find themselves rejecting the so-called neoclassical theory of value, whilst accepting an identical meta-theoretical approach to value theory – i.e. one rooted in mathematical modelling.² Instead, and following Veblen, Lawson argues that the real limitations lie at the level of *meta-theory*. More specifically, he argues that if neoclassical economics can be characterized by anything, then it is the following:

- i) a commitment to the view (at some superficial level) that social reality is causal-historical or causal-processual
- ii) a commitment to realisticness
- iii) a commitment to modelling economic phenomena mathematically, and
- iv) a failure to recognize that a commitment to (i) and (ii) simultaneously is contradictory.

In this chapter I elaborate upon, and extend, Lawson's arguments in three ways. First, I shift the discussion from economics in general, to *labour* economics in particular. Second, I show the limitations of attempts to define neoclassical labour economics at the level of *substantive* theory. I do this by, third, shifting the focus to the level of *meta-theory*. Here I show that, whilst the substantive theoretical concepts used to identify neoclassical labour economics come and go, the following remain:

- a) a commitment to the view (at some *very* superficial level) that labour markets are emergent, causal, processual, historical and open
- a₁) an inability to deliver on this commitment

- b) a commitment to realisticness
- b₁) an inability to deliver on this commitment

- c) a commitment to modelling labour markets mathematically, and
- d)
- e) a failure to recognize that the commitment to (a) and (b) simultaneously with (c) is contradictory.

¹ I want to thank Jamie Morgan for insightful comments on a previous draft of this chapter.

² The paradigm case is Sraffian value theory. For the record, I reject both neoclassical and Sraffian theories of value.

Part one elaborates upon, and extends, Lawson's key arguments, re-locating them in the specific context of *labour* economics. Part two focuses on the level of *substantive theory*. It identifies attempts made to define *neoclassical* labour economics in terms of five concepts (*labour supply and demand, methodological individualism, rational maximization, equilibrium* and *Pareto efficiency*) before showing that even this definition has been overtaken by events. Part three shifts the focus to the level of *meta-theory* and considers the way developments in mathematics, logic and philosophy of science encouraged a commitment to modelling labour markets mathematically. Part four shifts the focus once more, introducing the searching and matching approach that has marginalized, and may even have replaced, the supply and demand approach. There are two reasons for introducing the searching and matching approach. First, it means that supply and demand (and Pareto optimality) cannot be included in the core concepts that have been said to define neoclassical labour economics. Second, it shows that the commitment to mathematical modelling remains. Part five goes on to establish claims (a) to (d) above. A final section concludes.

Two notes of caution. First, when I present various attempts to define neoclassical labour economics at the level of substantive theory, and in terms of five core concepts, note that they are others' attempts: I am simply reporting them. Second, I will use the term 'mainstream' instead of 'neoclassical' when I want to use a less evocative term to refer to the most common school of contemporary economics.

1. Augmenting Lawson's key ideas

This section elaborates upon Lawson's key insights, hopefully, without changing their meaning.

Causal-processual or causal-historical

Let us start by elaborating upon what Lawson refers to as a causal-processual or causal-historical ontology.

The conception of social ontology I have in mind is processual in that social reality, which itself is an emergent phenomenon of human interaction, is recognised as being...highly transient, being reproduced and/or transformed through practice; social reality is in process, essentially a process of cumulative causation...Furthermore, social reality is found to be composed of emergent phenomena that...are actually constituted in relation (that is, are internally related) to other things, and ultimately to everything else (for example, students and teachers, *qua* students and teachers, are constituted in relation to each other; so are employers and employees...Constitutive social relations in short are a fundamental feature of social reality. So, social reality consists of emergent phenomena, constituting highly internally related causal processes. For ease of exposition in what follows I often simply refer to this alternative worldview as a causal-processual or causal-historical ontology or some such (Lawson 2013: 954).

This causal-processual or causal-historical ontology is a potted version of the social ontology Lawson has elaborated upon at length elsewhere. Because my arguments require a little more elaboration than this, I take the liberty of augmenting this along lines that I am sure Lawson would accept and, furthermore, placing them in the specific context of labour economics.

Social systems as causal, emergent, processual, historical and open

To get underway, let me introduce the term 'socio-economic phenomena', by which I have in mind things like agreements, codes, conventions, (proper) institutions, laws, mores, norms, obligations, precedents, procedures, regulations, (official and unofficial) rules, social structures, organisations and values. Most labour economists use the term '*institutions*' to refer to things like these, but I prefer to conceive of institutions as part of socio-economic phenomena (Fleetwood 2006, 2008a & b, 2010).³

The following is a more elaborated version of Lawson's (potted) social ontology.

- Labour market agents (e.g. workers selling labour services or searching for jobs, and firms demanding labour services or searching for workers⁴) enter into a pre-existing environment replete with socio-economic phenomena specific to labour markets. In order to formulate, and initiate, labour market oriented plans and actions, labour market agents have no option but to draw upon these socio-economic phenomena.
- By drawing unconsciously, implicitly and tacitly upon socio-economic phenomena like institutions, rules, norms, values and mores; and consciously, explicitly and non-tacitly upon socio-economic phenomena like agreements, codes, conventions, laws, obligations, precedents, procedures, regulations, social structures and organisations, labour market agents reproduce or transform these socio-economic phenomena.
- Labour markets are, or are constituted by, these socio-economic phenomena. Indeed, labour markets emerge from, but are irreducible to, those socio-economic phenomena reproduced or transformed by labour market agents.
- As labour market agents reproduce or transform these socio-economic phenomena, they simultaneously reproduce or transform themselves as labour market agents – e.g. as job searchers, demanders of labour services, unemployed, skilled, low-paid, discouraged etc. Via this reproduction or transformation both labour markets, and labour market agents, continue their existence into the future.

³ From personal correspondence I know Lawson would not use the terms 'institution' and 'habits' as I do here. I am currently trying to develop these concepts so perhaps it is best to treat them with some caution. Nothing of significance in this chapter depends upon them.

⁴ For simplicity I am using the term 'labour market agents' here to exclude those (agents) who, for example, work in a job centre, or who administer web-pages advertising vacancies. A job centre worker might become a labour market agent if she actively sought another job in another organisation.

- Labour market agents are not isolated atoms, driven by ‘immaculately conceived’ preferences, as Hodgson (2003: 160) puts it, and pre-programmed with one and only one imperative: to maximize some objective function. Labour market agents act, or more accurately *inter-act*, with other agents and do so only via social phenomena. The latter causally govern, but do not determine, agents’ preferences.
- Because the socio-economic phenomena that constitute labour markets are *transformed*, not just reproduced, by labour market agents, then labour markets are transient – i.e. they evolve and change. The way a specific category of workers search for jobs in one time period can be transformed due to (a) changes in the socio-economic phenomena they engage with; and/or (b) changes in their thinking – i.e. changes in their evaluations, interpretations, expectations, not just changes in preferences.
- This transformation, evolution and change make it most unlikely that labour markets will display event regularities, laws or law-like relationships. Labour markets are, therefore, likely to be characterized by lack of event regularities, laws or law-like relationships. Labour markets are likely to be *open, not closed, systems*.
- This transformation, evolution and change make it most unlikely that causality will be based upon event regularities, as in the regularity view of causation and the regularity view of law. In open systems causality is based upon powers and tendencies – where the latter does not mean (something like) a ‘rough and ready’ event regularity, or a probabilistic or statistical law (Fleetwood 2009, 2011a, 2011b, 2012). Lawson’s use of the term ‘causal’ then is a reference to causality as power or tendency.

This, or something very close to it, is what Lawson means by ‘causal-processual or causal-historical’. I will, henceforth, refer to ‘*social systems, including labour markets, as being emergent, causal, processual, historical and open*’ - and variations on this theme.

The failings of mainstream economics

From here, Lawson goes on to what he considers to be the failing of mainstream economics:

the failings of the discipline arise just because economists everywhere are seeking to provide analyses of a social system that is, amongst other things, open (in the sense of not consisting in event regularities), processual and highly internally related, in terms of formulations that require that the social realm be treated as if made of closed systems of isolated atoms (Lawson 2013: 955).

The failings arise because mainstream labour economists are seeking to provide an analysis of a system that really is emergent, causal, emergent, processual, historical and open in terms of formulations that require the system to be theorized as if it has none of these properties.

2. Attempts to define *neoclassical* labour economics

It is not clear if the term 'neoclassical' refers to a set of ideas, concepts, tools, techniques, theories and models, or to a more general view, hypothesis, paradigm, perspective or approach – all of these terms appear in the literature. To get some consistency into the discussion I will use the following phraseology. I will consider the attempts made by others to define a neoclassical *approach* to labour economics in terms of a set of *core concepts*.

Virtually all attempts to define the *neoclassical* approach to *labour* economics have focused upon the level of substantive theory, and five core concepts have been identified. The central concept is labour supply and demand (curves or functions), which is then analyzed using methodological individualism, rational maximization, equilibrium and Pareto efficiency.

Many mainstream labour economists feel no need to even mention the term 'neoclassical'. Examples are labour economics textbooks by Borjas (2010), Bosworth *et al* (1996), Ehrenberg & Smith (2009), McConnell *et al* (2006) and Smith (2009). Other textbooks, by contrast, do feel the need to *mention* the term, but they offer little or no elaboration. Examples include Addison & Siebert (1979), Coleman (2010), Elliot (1994), Fallon & Verry (1988), Hamermesh (1996), Hyclack *et al* (2013), Killingsworth (1983) and Sloane *et al* (2013). Cahuc and Zylberberg's (2004) textbook is a little curious because, although they mention the term, and have a chapter dedicated to the *neoclassical* theory of labour supply, they have no chapter dedicated to *neoclassical* theory of demand. Indeed, none of their other chapters have the term 'neoclassical' in their titles. To simply mention the term 'neoclassical' without feeling the need to elaborate, I have the following kind of thing in mind:

the neoclassical paradigm [is] grounded in a view of rational maximising behaviour on the part of the individual, a group of individuals or a firm [that] provides a logical framework with which to interpret and to predict behaviour in labour markets (Elliott 1991: xvii).

Most *intermediate* level books hardly mention the term 'neoclassical' either. Examples are Booth (1993), Boeri & van Ours (2008), Hamermesh (1993), Garibaldi's (2006), Killingsworth (1983), Manning (2005), Marsden (1999), St Paul (2000). The same goes for the prestigious *Handbook of Labour Economics* (Ashenfelter & Layard 1986a & b; Ashenfelter & Card 1999a, b & c and 2011, and Card & Ashenfelter 2011), and Borjas's recent collection, *The Economics of Labour* (2014). Combined, these two texts constitute around one hundred and seventy papers. The term 'neoclassical' crops up throughout, but the more important point is that the editors feel no need to include even one paper defining the term.

There are, however, a handful of labour economists who have attempted to identify the core concepts that might define neoclassical labour economics such as Kaufman &

Hotchkiss (2006), King (1990), Laing (2011), Petridis (1999) and Tilly & Tilley (1998).⁵ These authors identify the following as core concepts: methodological individualism, rational choice/maximizing behaviour, equilibrium and Pareto efficiency.

There is, however, something very strange about these four core concepts, namely, the absence of any reference to the *labour supply and demand*. Discussing developments in neoclassical theory, Cahuc & Zylberberg note that the seminal textbook authored by the Institutionalist Reynolds, appeared in 1949, and was still in use in the 1970s, despite the fact that it contained *no analysis of supply and demand*. Things then started to change.

The first textbooks to build on a theoretical foundation, neoclassical in inspiration, saw the light in the 1970s. In [these] books, the descriptive aspect was considerably reduced, and the chapters were organized around topics that claimed to apply general principles of economic theory (Cahuc & Zylberberg 2004: xxvi).

Mortensen makes a similar point about theorizing before the late 1960s:

The prior theoretical lens used to view the labour market was the 'supply and demand' framework of neoclassical economics (Mortensen 2011: 1074-5).

This had been the case ever since Hicks (1932) synthesised various existing economic concepts into the model of labour markets recognizable today. Pick up any contemporary labour economics textbook and similar sentiments to Hick's can be found, for example:

The most pervasive theory of the labour market is the neoclassical theory of labour supply and labour demand interacting to determine an optimal combination of wages and employment. This theory represents a good starting point for a textbook of labour economics because it is consistent with the microeconomic analysis found in the traditional theory of the firm and the analysis of consumer behaviour (Smith 2009: 2).

This sentiment can be found in journal articles too:

Neoclassical models refer to concepts of the supply-and-demand model and predictions on the degree to which wage increases reduce demand for labour....Wages, it is assumed, are determined by the marginal productivity of labour in the competitive labour market. In the basic neoclassical model, the price of labour is determined at the equilibrium of labour supply and demand (Kwon 2005: 62).

Addison & Siebert (1979: 2) refer to this as the '*central core of thought in labour economics*'. This makes perfect sense. Labour economics is the sub-discipline of economics dedicated to the analysis of labour markets, that is, to the analysis of both

⁵ It is curious that the textbook by Institutionalist Reynolds *et al* (1998) does not mention the term.

labour *and* markets. And in the discipline of economics, markets are universally understood (or misunderstood) as places where suppliers and demanders come together to determine prices and quantities.⁶

Now, whilst Kaufman & Hotchkiss (2006), King (1990) Petridis (1999) and Tilly & Tilley (1998) try, they do not succeed in identifying a consistent core of neoclassical labour economics because each of them goes on to add other concepts. King adds the principle of substitution. Tilley and Tilley (1998: 6-8) consider the neoclassical view to be based upon a commitment to 'a naturalistic framework' (a kind of ahistorical universalism); a lack of attention to coercive structures; given, stable and consistent preferences, determined outside of the world of work; a commitment to rational expectations; a belief in the symmetry of (Walrasian) power; and a belief that marginal productivity theory solves the problem of income distribution between workers and between workers and capitalists. Whilst Kaufman & Hotchkiss (2006: 28-30) have a section entitled *The Neoclassical School*, they note that recent developments within the school means that 'whether this new approach is still neoclassical, at least as far as this term was originally conceived, is a matter of debate' (28). They see neoclassical labour economics in terms of Becker's idea that the economic approach is not the study of markets *per se*, but the application of a model of rational maximizing behaviour to all aspects of human life. A corollary of this involves the mathematical technique of constrained optimization. For them, central to neoclassical theory, is the belief that labour markets are, some unique features notwithstanding, similar to all other markets and can be studied with the same theoretical model. They also believe that neoclassical economics, whether in price-theory or choice-theory, adheres to a general version of the invisible hand. Unlike most commentators, Kaufman & Hotchkiss also believe neoclassical economics has certain methodological commitments. There is a preference for deductive over inductive reasoning. Because deductivism requires the use of a few general assumptions, it invites problems when these assumptions do not accord with real-world labour markets. There is heavy reliance on marginal decision rules. The final distinctive aspect of neoclassical methodology (which seems to me to be *three* aspects) is 'a commitment to a uni-disciplinary, heavy formalistic (mathematical) and imperialistic approach to theorizing' (ibid: 30). Petridis also includes the concept of the margin, substitution and competitive markets. He adds: 'In methodology there is a strong tendency to abstraction and a reliance on deductive reasoning, which invariably involves the application of mathematical techniques' (Petridis 1999: 788-9). Petridis also mentions the 'Marshallian cross (supply and demand curves)'. Laing (2011) is a little harder to fathom. His introduction has a fourteen page section entitled 'The Supply and Demand Framework', concluding with the observation that:

In fact it is probably fair to say that most labour economists first don their supply-demand spectacles when they wish to examine a new phenomenon...Yet despite its strengths, the framework suffers from several limitations (Laing 2011: 22).

⁶ Note that sometimes references are made to the 'Walrasian' approach or to the analysis being 'perfectly competitive'. These are oblique references to approaches and analyses using specific forms of labour supply and demand curves.

He then goes on to offer five pages explaining the 'four main pillars of the neoclassical approach' (noted above) without any mention of the supply and demand framework he has just discussed at length. It seems to me, however, that if labour economists 'first don their supply-demand spectacles' before turning to methodological individualism, rational choice/maximizing behaviour, equilibrium and Pareto efficiency, then they ought to identify supply and demand as part of this core.

Pause to take stock

Attempts to define the *neoclassical* approach to *labour* economics have focused upon the level of substantive theory, and five core concepts have been identified. Unfortunately, this definition has been overtaken by events, as the following section will show.

Change and evolution in the discipline of mainstream labour economics

Let us consider how the discipline of labour economics has changed and evolved since the 1970s.

Since then, labour economics has undergone the same evolution as many other fields. Economic theory has made strides in the analysis of strategic relations and information asymmetries, and dynamic behaviour; data of the most various kinds are accessible, and statistical techniques have improved, along with the calculational capacities of modern computers; all these factors led to a profound restructuring of labour economics in the last three decades of the twentieth century (Cahuc & Zylberberg 2004: xxvi).

Mortensen makes a similar point:

The prior theoretical lens used to view the labour market was the 'supply and demand' framework of neoclassical economics....[T]his approach assumes exchange in a centralized market in which information about the goods and services traded as well as the price are perfect...In the late 1960s a group of economists...started to think about a more nuanced conception of the labour market based on observations regarding the actual experiences of individual workers over time...Early on, theorists realized that a dynamic 'flows approach' was needed for an adequate analysis of unemployment fluctuation (Mortensen 2011: 1074-5).

The term 'neoclassical', *might* have been appropriate once, so the argument goes, but it has been overtaken by events. Kwon (2012: 61) refers to 'neoclassical, labour monopsony, and Harris-Todaro models', as well as the 'efficiency wage model' and 'dual labour market theory'. This makes the neoclassical approach (model or theory) just one of several. D'Auria *et al* (2010) express a similar sentiment when, drawing upon a paper by Pissarides, they write:

there are broadly four different hypotheses which try to describe the labour market: the neoclassical view, the efficiency wage approach, the wage bargaining theory and the search model (D'Auria *et al* 2010: 66).⁷

So, in addition to the neoclassical approach (model, theory, hypothesis, framework or lens) there is also labour monopsony, Harris-Todaro, efficiency wages, dual labour market, wage bargaining and search approaches. But why stop here? There has been a proliferation of new ideas in the last thirty or forty years – such as:

Transitional labour markets, assimilation (vis-à-vis migration) theories, dual and segmented labour markets; efficiency wage theories; insider-outsider theories, principle-agent theories; the searching and matching approach to labour markets involving job creation, job destruction/separation, job flows, job searches and job matches; theories of pre-market and in-market discrimination and prejudice including discrimination by gender and race (but not, strangely, by class); human capital theories with various concepts of education, training and learning; hedonic theories; theories of screening and signaling; theories of tournaments; theories of different wages and payment systems; theories of unions and union-employer bargaining. Then there are ideas, and concepts, such as: job and worker churning, explicit, implicit, psychological, relational, self-enforcing and deferred payment contracts; asymmetric and imperfect information; monopolistic competition; free-riding; high performance work and work-places; incentives; job attributes; job ladders; job networks; job security; job stability; job shopping; low, middle and high ability workers; moral hazard; stigma effects not to mention concepts like lemons, fattism and good looks.

Changes and evolution in mainstream thinking have contributed to the difficulty in finding a definition of neoclassical labour economics at the level of substantive theory. But what about at the level of meta-theory, especially developments in mathematical modelling?

3. Mathematical modelling

Recall D'Auria *et al* who set out four different hypotheses describing the labour market. Despite differences in these hypotheses, they spot a 'generic wage rule covering all four hypothesis'.

$$w_t - p_t^e = a_0 + (1 - \mu)b_t^e + \mu pr_t^e - \beta\mu_t + a_t^w$$

Workers / trade unions negotiate a nominal wage w_t at time t conditional on the price expectation p_t^e , on the expected level of the reservation wage b_t , on expected productivity $pr_t - y_t - l_t$ and on the unemployment rate u_t . The term a_t^w is a shock to the wage-setting rule (D'Auria *et al* 2010: 66).

The important thing here is *not* to focus on the particular variables in the equation, but to focus on the *equation itself*. Despite neoclassical, efficiency wage, wage bargaining and

⁷ D'Auria *et al* do not define the term 'neoclassical'. They refer to 'an atomistic labour market without any market power for workers such as in the neoclassical model' without defining the term 'atomistic'. Nor do they clarify what they mean by a *hypothesis* that *describes* the labour market. Pissarides does *not* use the term 'neoclassical' but rather 'competitive'.

search theories all being different theories, involving different concepts, they are always modelled mathematically. Indeed, if I went on to add other theories (e.g. human capital theories); to change the assumptions about the degree of competition (e.g. from perfect to imperfect or monopolistic competition); and to include this or that labour market institution and/or friction, all this could be, and indeed is, modelled mathematically. The upshot of this is simple, but this should not be interpreted to mean it is unimportant: far from it. *Various theoretical concepts can come and go, including labour supply and demand (as we will see later), but mathematical modelling remains.* Let us have a closer look at Lawson's ideas on mathematical modelling.

Lawson and mathematical modelling

Let me start with a sketch of Lawson's argument. The belief that economics (and maybe all social sciences) could, and should, be mathematized, emerged with the Enlightenment. By the late 19th and early 20th century, economists with a mathematical bent were under pressure to adopt methods similar to those of some natural sciences, especially physics. Indeed the classical reductionist programme advocated the reduction of all mathematics-based disciplines to the strictly deterministic approach of mechanics, with its emphasis on techniques of infinitesimal calculus. For various reasons, especially the emergence of relativity and quantum mechanics, this programme eventually withered and was replaced by a new orientation deriving from the work of Hilbert, and the Bourbaki School. Lawson goes on to claim that mathematics came to be conceived of as a discipline or practice, properly concerned with providing a pool of frameworks for *possible realities*; and concerned with formulating systems comprising sets of axioms and their deductive consequences, with these systems in effect taking on a life of their own. This influenced mathematical economists who: came to regard the task of finding applications as being of secondary importance at best, and not of immediate concern; postponed the day of interpreting their preferred axioms and assumptions; no longer regarded it as necessary, or even relevant, to consider the nature of social reality; and were potentially oblivious to any inconsistency between the ontological presuppositions of adopting a mathematical modelling emphasis and the nature of social reality. In sum, *reality* ceased to be a major concern for mathematics and, more importantly, mathematical (labour) economics.

Certainly the contemporary discipline [of economics] is dominated by a mainstream tradition. But whilst the concrete substantive content, focus and policy orientations of the latter are highly heterogeneous and continually changing, the project itself is adequately characterised in terms of its enduring reliance, indeed, unceasing insistence, upon methods of *mathematical modelling*. In effect it is a form of *mathematical deductivism* in the context of economics (Lawson 2013: 950).

I am, largely, in agreement with Lawson's historical argument vis-à-vis the drive to mathematize economics. Indeed, Cahuc & Zylberberg probably speak for most labour economists when they write:

Today, labour economics, like many other areas of economic analysis gives pride of place to teaching methods based upon mathematical models...But the domination of formalized economics is not the outcome of a random draw from

among several possible equilibria. For one thing, economic science lends itself to formalization, since it deals with quantified magnitudes....A mathematical model allows us to clearly establish a linkage between hypothesis and results. It proves particularly effective, indeed indispensable, when the mechanisms studied are complex and involve the relations among a number of variables. Formal models of economic activity are entirely unavoidable (Cahuc & Zylberberg 2004: xxviii).

I also accept that mathematical economics was influenced by the work of Hilbert, and the Bourbaki School. I differ only in the sense that I believe that the desire to mathematize was (and still is) part of a *wider intellectual milieu* that has shaped contemporary (labour) economics. This milieu includes developments in logic and philosophy of science.

Philosophy of science witnessed a complex shift from logical-positivism, with its syntactic view of theories (where theories are sets of uninterpreted statements presented in a formal language) to post-positivism and a shift of focus from theories to models, culminating in the semantic view of models, often referred to as the model-theoretic view, or structural view. Part of this shift, however, involved developments in logic, especially the work of Tarski and logical operations, the further establishment of a logico-mathematic language, and developments in set theory. The inter-connected nature of the developments in mathematics, logic and philosophy of science makes it difficult for them to be 'unpicked', as it were, and causal efficacy attributed to them independently (Backhouse 1998: 1848).

These developments in mathematics, logic and philosophy of science have, arguably, encouraged a similar lack of concern for reality in economics. As Bouman & Davis (2010 : 28) put it, in this genre, 'one plays with symbols devoid of any meaning according to certain formal rules that are agreed upon in advance'. They go on to cite the 'punch line' delivered by the Nobel Prize laureate Debreu: 'Allegiance to rigor dictates the axiomatic form of analysis where the theory, in the strict sense, is logically entirely disconnected from its interpretations' (ibid: 29).⁸

Pause to take stock

That contemporary (labour) economics is preoccupied with mathematical modelling, is not doubted by anyone. What is doubted, however, is whether or not this commitment to mathematical modelling is consistent with (a) a commitment to the view (at some *very* superficial level) that labour markets are emergent, causal, processual, historical and open; and (b) a commitment to realism. These, and other, issues will be explored in the next section, using the example of the search and matching approach.

4. The searching and matching approach to labour markets

In the last couple of decades, mainstream labour economics has undergone a seismic shift. The searching and matching approach now competes with the labour supply and demand

⁸ A good example of this is Sutton's (2000) book on economic models, which seems to implicitly presume a model-theoretical approach to economic modelling without feeling the need to make it clear. For historical accounts, see Morgan (2012) and Bouman & Davis (2005).

approach, and may even have replaced it at the centre of mainstream labour economics. The searching and matching approach, schematized in figure 1, can be summarized thus:

- Jobs are continually being created
- Jobs are continually being destroyed
- Workers (both employed and unemployed) are continually searching for jobs
- Firms are continually searching for workers
- When jobs are created, some searching workers find these jobs
- When these workers find these jobs, some workers accept these jobs
- When searching workers find and accept jobs, then workers are matched to jobs and their state changes from unemployed to employed or from being employed in firm A to being employed in firm B
- When matching occurs, workers flow out of unemployment
- When jobs are destroyed, workers flow into unemployment
- There are three types of flows into unemployment:
 - flows involving those currently not in the labour force at all
 - flows involving those in the labour force but unemployed
 - flows involving those who are currently employed
- There are two types of flows out of unemployment:
 - flows involving those who gain employment
 - those who drop out of the labour force
- Any change in the level of unemployment is equivalent to the number of workers flowing into unemployment, minus the number of workers flowing out of unemployment:
 - If inflows exceed outflows, unemployment is rising
 - If outflows exceed inflows, unemployment is falling
 - If inflows equal outflows, then unemployment is constant, in a steady state
- All of this occurs in time
- All of this occurs in a labour market containing 'frictions' such as, but not restricted to, imperfect information and perhaps 'institutions'.

FIGURE 1 ABOUT HERE

The searching and matching approach has abandoned labour supply and demand curves - and Pareto efficiency, which I will say no more about. Any role labour supply and demand continue to play is, at best, indirect. Moreover, the *theories* of labour supply (based upon the work-leisure trade off) and labour demand (based upon marginal productivity) are unnecessary to derive the wage curve, job creation curve or the Beveridge curve - i.e. the theoretical core of the searching and matching approach. These theories *may not* even be necessary to derive many of the searching and matching approach's other concepts - much depends upon the details of the particular model. I say 'may not' because the searching and matching approach is notoriously lacking in 'micro-foundations', so it is often difficult to see what micro-concepts are, and are not, used or presumed.

I am not aware of anyone actually stating, clearly and unequivocally, that the searching and matching approach has actually replaced the supply and demand approach. Most comments make the less controversial point that the searching and matching approach can deal with important concepts, and address important questions, that the supply and demand approach cannot – as the following comment shows:

While the usual paradigm of supply and demand in a frictionless labour market is useful for discussing some issues, many important questions are not easily addressed with this approach....From its inception, search [and matching] theory has provided a rigorous yet tractable framework that can be used to address these and related questions (Rogerson *et al*/2005: 959).

There is no canonical searching and matching model, and many could serve as examples, so I have chosen the following model from Pissarides because it is well known. Pissarides comes close to saying that the searching and matching approach has replaced the labour supply and demand approach. Indeed, he cites Hall favourably because his analysis ‘implies that there are no conventional supply and demand functions’ (Pissarides 2011:1101). Moreover, Pissarides actually states that his model:

replaces the conventional demand and supply diagram for labour with a new diagram with the Beveridge curve as its centerpiece....Figure [2] shows the equilibrium for tightness and wages. Recall that (1.22) is the job creation curve, and in tightness-wage space, it slopes down: Higher wage rate makes job creation less profitable and so leads to a lower equilibrium ration of jobs to workers. It replaces the demand curve of Walrasian economics. Equation (1.23) is the wage curve and it slopes up: At higher market tightness the relative bargaining strength of market participants shifts in favour of workers, it replaces the supply curve. Equilibrium (θ, w) is at the intersection of the two curves (Pissarides 2000: 19).

FIGURE 2 ABOUT HERE

The wage curve

The wage curve is given by:

$$w = (1 - \beta)z + \beta p (1 + c\theta) \quad (1.23)$$

- w cost of labour
- θ tightness of the labour market, i.e. the vacancies to unemployment ratio (v/u)
- β worker bargaining power
- z unemployment benefits
- p output of the job
- c hiring cost

Job creation curve or condition

Pissarides first derives the asset value of a *vacant* job

Let J be the present-discounted value of expected profit from an occupied job and V the present discounted value of expected profit from a vacant job. With a perfect capital market, an infinite horizon and when no dynamic changes in parameters are expected, V satisfies the Bellman equation

$$rV = -pc + \theta q(\theta)u$$

He then derives the asset value of an *occupied* job

The flow capital cost of the job is rJ . In the labour market, the job yields net return $p-w$ where p is real output and w is the cost of labour. The job also runs the risk of λ of an adverse shock which leads to the loss of J . Hence J satisfies the condition,

$$rJ = p-w - \lambda J$$

With a little manipulation he derives the job creation curve

$$p - w - \frac{(r + \lambda)pc}{q(\theta)} = 0 \quad (1.22)$$

w	cost of labour
r	rate of interest
pc	vacant job cost
p	output of the job
θ	tightness of the labour market
$q(\theta)$	rate at which workers arrive at vacant jobs
λ	rate of an idiosyncratic, adverse, shock that destroys jobs

In equilibrium, the zero profit condition holds. Output is assumed to remain constant. The (discounted) rate of job destruction is exogenous. The hiring costs change state with rate $q(\theta)$. A fall in the wage rate is offset by an increase in the rate at which vacancies are filled. The job creation curve is downward sloping.

Beveridge curve

The Beveridge curve is derived from two flows, and expresses these two flows as follows:

- Job creation takes place when firm and worker search, meet and agree to form a match, causing a flow out of unemployment.
- Job destruction takes place when an exogenous, negative, idiosyncratic shock to occupied jobs arrives at the Poisson rate λ , causing a flow into unemployment.

The evolution of mean unemployment is given by the difference between the two flows,

$$\dot{u} = \lambda(1 - u) + \theta q(\theta)u$$

In the steady-state, the mean rate of unemployment is constant, so

$$\dot{u} = \lambda(1 - u) + \theta q(\theta)u$$

Pissarides re-writes this equation as an equation determining unemployment in terms of two transition rates, which is the Beveridge curve.

$$u = \frac{\lambda}{\lambda + \theta q(\theta)} = 0 \quad (1.21)$$

Pissarides goes on to show the steady-state equilibrium with a second diagram in vacancy and unemployment space. He transposes the job creation curve into a straight line through the origin with slope θ . The steady-state condition for unemployment (1.21) is the Beveridge curve.

FIGURE 3 ABOUT HERE

Pause to take stock

Marginalising, or even abandoning labour supply and demand, leaves the definition of *neoclassical* labour economics based on just three concepts: equilibrium, methodological individualism, and rational maximization. More important, however, is the following observation. The searching and matching approach, just like the supply and demand approach, is rooted in mathematical modelling. *One set of curves, or one set of mathematical functions, have been swapped for another set, but the commitment to mathematical modelling remains.*⁹ Even equilibrium, methodological individualism, and rational maximization, are retained not because they are requirements of theory, but because they are requirements of mathematical modelling. I will come back to this towards the end of part five.

5. Reflecting upon the searching and matching approach

Are advocates of the searching and matching approach committed to (a) the view that labour markets are emergent, causal, processual, historical and open systems; and (b) realism? Let us consider these questions in turn, starting with the latter.

Searching, matching and realism

The issue of realism is highly problematic within mainstream labour economics. On the one hand, a series of passing comments seem to suggest a commitment to realism – i.e. models should be realistic; it would be better if models were more realistic; or realistic assumptions are preferred to unrealistic ones - and variations on this theme. On the other hand, more specific methodological claims suggest that theories and models *cannot* be realistic.

⁹ I have left the mathematics, and the curves in the following section, to emphasise the point that the commitment to mathematical modelling is as central to the search and matching approach as it is to the supply and demand approach. I thank Tony Lawson for raising this point.

Passing comments indicating a commitment to realism

One of the appeals of early search theory was that it appeared realistic....A process whereby both workers and firms search for each other and jointly either accept or reject the match seemed to be closer to reality (Pissarides 2011: 1093).

Keynes's famous statement that the unemployment of workers between jobs can be ignored...is unverified conjecture. *Descriptively it is false*: With the exception of a few 'discouraged' workers, unemployed workers are always between jobs, or between some other state and a job (Pissarides 2000: xv, emphasis added).¹⁰

The model [in this chapter] *does not yet claim to be realistic* or empirically implementable. At this stage many of the variables that are likely to be important in an empirical analysis of unemployment are left out (Pissarides 2000: 3, emphasis added).¹¹

We extend the NK [New Keynesian] model by introducing a more realistic labour market, with frictions similar to those found in the Diamond-Mortensen-Pissarides searching and matching model of unemployment (Blanchard & Galí 2010: 1).

The matching function...encapsulates searching and matching frictions, allowing a more realistic description of the labour market, and of unemployment (Stevens 2007: 847).

There are several reasons why it is important to know the actual matching pattern in the market. First, it allows us to test different economic models that predict distinct matching equilibrium patterns, and this gives insights into the realism of the assumptions on which the models rely (Mendes 2010: 929).

The incorporation of wage stickiness makes employment realistically sensitive to driving forces...I conclude that a realistic model of the labour market needs to invoke a market-wide force that has powerful effects on the recruiting efforts of employers (Hall 2005: 50 & 53).

[T]he simple supply-and-demand approach is ill suited for discussing questions such as those raised in the previous paragraph....Traditional frictionless models assume that a worker can costlessly and immediately choose to work for as many hours as he wants at the market wage. By relaxing

¹⁰ This implies that Pissarides prefers claims that are not descriptively false, but perhaps descriptively true.

¹¹ It only seems worth mentioning this if, in later chapters, Pissarides intends to add some important variables and makes the model *realistic*. He does not do this.

these extreme assumptions, search models allow us to think about unemployment and wages in a different light (Rogerson *et al*/2005: 963).¹²

It would probably be more realistic to incorporate some degree of wage stickiness in the model;...[T]o make the model more realistic, it is often calibrated to replicate the results given by Calvo;...I make this assumption because it is more realistic (Zanetti 2011: 646).

Comments like these seem to illustrate a commitment to some kind of realism – although, it is worth noting that the terms ‘realism’ and ‘unrealism’ are never defined. What about specific methodological claims?

Comments indicating that models cannot be realistic

Any time we attempt to explain a complex set of behaviours and outcomes using a few fundamental influences, we have created a *model*. Models are not intended to capture every complexity of behaviour; instead they are created to strip away random and idiosyncratic factors so that the focus is on the general principles (Ehrenberg & Smith (2009:4-5).

We could, of course, create a more complex model of the...labour market that incorporates every single one of these omitted factors. Now that would be a tough job! A completely realistic model would have to describe how millions of workers and firms interact and how these interactions work themselves out throughout the labour market. Even if we knew how to accomplish this difficult task, this ‘everything-but-the-kitchen-sink’ approach would defeat the whole purpose of having a theory. A theory that mirrored the real-world labour market...down to the most minute detail might indeed be able to explain all the facts, but it would be as complex as reality itself, cumbersome and incoherent, and thus would not at all help us understand how the...labour market works (Borjas 2010: 8).

There has been a long debate over whether a theory should be judged by the realism of its assumptions or by the extent to which it finally helps us understand and predict the labour market phenomena we are interested in. We obviously have a better shot at predicting labour market outcomes if we use more realistic assumptions. At the same time, however, a theory which mirrors the world too closely is too clumsy and does not isolate what *really* matters. The ‘art’ of labour economics lies in choosing which details are essential to the story, and which are not. There is a trade-off between realism and simplicity, and good economics hits the mark just right (Borjas 2010: 8).

If a model exactly mirrored the reality of a given situation, then it would be too complicated for anybody to comprehend it...Consequently, models must

¹² I take the reference to ‘extreme assumptions’ as a reference to unrealistic assumptions. It cannot pass without comment that Rogerson *et al*’s paper is replete with assumptions that are extreme and unrealistic, yet he chooses not to mention them.

entail simplifications in order for them to be useful...The process of simplification necessarily entails making choices about what to include in the analysis and what to exclude from it (Laing 2011: 3-4).

They [economists] thus argue that the theory underlying positive economics should be judged on the basis of its *predictions*, not its assumptions (Ehrenberg & Smith 2009: 4).

The more important point, however, is that economists do not judge a theory by its descriptive content but rather by its ability to predict. The strength of neoclassical theory is that it yields a number of testable predictions regarding the demand for factors of production. It is on the empirical performance of these predictions that theory should be judged (Fallon & Verry 1988: 99).¹³

Of course, economic models do not have to be realistic to be useful, and the supply-and-demand paradigm is obviously useful for studying many issues in labour economics (Rogerson *et al* 2005: 963).

The argument contained in these comments can be summarized thus:

Because labour markets are complex phenomena, all models must simplify and idealize, meaning that models of labour markets will always, strictly speaking, be unrealistic. This is not a problem because, as Friedman taught, the objective of building models is to derive predictions.

This argument only 'works' by trading on an illicit, and illegitimate, opening gambit. Realisticness is equated to something like *detailed description* -i.e. where the model 'mirrors the real-world labour market...down to the most minute detail' as Borjas puts it. Detailed description is treated as a mixture of impossibility and absurdity and, thereby, rejected. The way is then paved for existing models of labour markets to be accepted as legitimate, irrespective of how unrealistic they are. Friedman's Instrumentalism then delivers the *coup de grace*, by prioritizing prediction over realisticness.

There are several problems with this argument that cannot pass without comment, I want to mention four. First, I am not aware of any critic of the unrealisticness of mainstream economics, who goes on to advocate the use of descriptively detailed models. Second, as the above passing comments indicate, any commitment to Instrumentalism is 'honoured in the breach'. Mainstream labour economists are *not* committed to Friedman's Instrumentalism, this doctrine is 'wheeled out' by the authors of text-books who (understandably) feel the need to say something to students about the unrealisticness of mainstream models. Third, it ignores other mainstream methodological defences of unrealisticness, such as the concept of 'successive approximation' - i.e. the successive relaxation of assumptions in order that models come to approximate reality.¹⁴ Fourth, this

¹³ In a footnote (15) they refer the reader to Friedman's 1953 *Essays in Positive Economics*.

¹⁴ Lest there be any misunderstanding, note that I do *not* think this is a plausible defence. It is possible that Rogerson *et al* (above) have this in mind when they refer to 'relaxing these extreme assumptions'.

argument is, arguably, an 'evasive justification' (Mäki 2010: 73).¹⁵ It *evades* serious criticism, whilst *justifying* the continued use of unrealistic models. As a result, *quite literally*, any degree of unrealisticness could be justified. There would, for example, be no way to argue against the use of a concept like 'matching angels' who descend from heaven and bring workers and employers together.

How, then, to proceed? Establishing more sophisticated definitions of realisticness and unrealisticness, and using them to evaluate searching and matching models is, clearly, beyond the scope of this chapter. But fortunately, there is a simpler way to proceed, based upon the fact that mainstream economists themselves accept that their models are unrealistic, irrespective of the definition. The late Hahn, himself an ardent mathematical economist, put matters succinctly:

When a mathematical economist assumes that there is a three good economy lasting two periods, or that agents are infinitely lived...everyone can see that we are not dealing with any actual economy. The assumptions are there to enable certain results to emerge and not because they are taken descriptively (Hahn, cited in Lawson 1997: 110).

Consider the following:

Workers differ not only in age, but also in their level of general human capital or skill, xh . Workers enter the labour market with the lowest skill, $x1$, and have chances to accumulate it up to xH , where $0 < x1 < x2 < \dots < xH$. While employed, human capital appreciates by one level during each period with probability $\rho \in [0, 1]$ (Esteban-Pretel & Fujomoto 2014: 579).

To say workers differ in age or skill levels is realistic – even if we cannot measure these skill levels. To say that human capital appreciates by one level during each period with probability $\rho \in [0, 1]$ is unrealistic in several senses: (a) even if the concept of human capital makes sense¹⁶, it is impossible to measure *meaningfully*;¹⁷ (b) even if it was measurable, it might well decrease as well as increase, and/or oscillate between increasing and decreasing over successive periods; (c) the precision underlying the idea that a precise unit of this human capital 'stuff' accumulates in precise units of time is an unrealistic (and spurious) precision; and (d) the idea that human capital accumulates at a rate somewhere between complete improbability and complete certainty is totally vacuous.

To be fair, Esteban-Pretel & Fujomoto probably know this is unrealistic. They assume it for reasons of tractability – i.e. without it (or something like it) human capital appreciation cannot be modelled mathematically. The fact is all mathematical models require the use of

¹⁵ I should point out that Maki is dealing with falsity, not unrealisticness, but I cannot elaborate here.

¹⁶ See Hodgson (2014) for critical comments on human capital.

¹⁷ Quite literally, *anything* can be measured if we are prepared to make enough assumptions and to accept extremely dubious proxies. But what really matters is whether or not the resulting measures are sensible, informative or meaningful. See Fleetwood & Hesketh (2010: circa 160)

unrealistic assumptions that are made solely to ensure mathematical tractability. I cite one example: ¹⁸

The search literature has implicitly assumed a memory loss assumption because all separations are modelled to be permanent. This implicit assumption is not completely relaxed here for tractability reasons. If agents kept full records of their employment histories, the setup would become highly intractable as workers could be rehired by potentially infinitely many firms. Likewise, the time elapsed since a separation is not recorded for tractability reasons (Ferandez-Blanco 2013: 888).

Pause to take stock

How, then, should we interpret these views on realisticness? First, mainstream views on this matter are deeply problematic in the sense that they are under-elaborated, philosophically unsophisticated, confused, confusing and contradictory. Second, irrespective of passing comments indicating a commitment to realisticness, *mainstream models are unrealistic*, and everyone knows this, including mainstream economists. As a result, we end up with three plausible interpretations: ¹⁹

- Interpretation one (i) takes the passing comments seriously; (ii) *rejects* the methodological claim that models cannot be realistic; (iii) interprets mainstream economists as being committed to realisticness; meaning (iv) that mainstream economists cannot deliver on this commitment.
- Interpretation two (i) does *not* take the passing comments seriously (i.e. takes them as mere 'lip service'); (ii) *rejects* the methodological claim that models cannot be realistic; and (iii) interprets mainstream economists as *not* being committed to realisticness.
- Interpretation three (i) does *not* take the passing comments seriously; (ii) *accepts* the methodological claim that models cannot be realistic; and (iii) interprets mainstream economists as *not* being committed to realisticness.

Which of these interpretations can be defended? I reject the second interpretation on the grounds of a *reductio ad absurdum*: a commitment to the construction of knowingly unrealistic models, *without even the pretence of a methodological justification*, would be self-evidently absurd. Whilst this could be an example of labour economics influenced by the developments in mathematics, logic and philosophy of science discussed in part three, I cannot find any comments, not even in passing, indicating that mainstream economists are *not* committed to realisticness. I reject the third interpretation on the grounds that the methodological claim that models cannot be realistic is something mainstream economists 'wheel out' when put on the spot. The claim, only 'works' because it evades, and it evades only insofar as it is not examined too closely. It is not a defensible claim. By default, then, I

¹⁸ Pissarides (above) assumes 'a perfect capital market, an infinite horizon and when no dynamic changes in parameters are expected...'

¹⁹ I address some of these issues in the case of the economics of trade unions in (Fleetwood 1999).

accept the first interpretation, and conclude thus: *mainstream labour economists, exemplified by advocates of the searching and matching approach, are committed to realism; their problem is that they cannot deliver on this commitment.*

Before leaving this section I want to mention an important issue. Some labour economists, especially econometricians committed to empirical research, appear to avoid the obvious unrealisticness of mathematical modellers. Lawson makes the argument and the counter-argument succinctly:

If there are exceptions to the latter sorts of formulations, these arise in the few exercises where the emphasis on mathematical modelling is retained but the modellers seek to avoid the usual unrealistic (atomistic and isolationist) conceptions by downgrading the role of theorising almost entirely. In such cases attempts are usually made to avoid theorising in terms of causal factors altogether as the emphasis is placed more on data information than theorising, as or where faith is placed, as with some modern approaches to econometrics, is more or less simply uncovering event regularities (Lawson 2013: 954).

It is, then, a pyrrhic victory that avoids the criticism of unrealisticness by retreating to various forms of ultra-empiricism that downgrade the role of theorising almost entirely.

Searching & matching, and emergent, causal, processual, historical and open systems

In order to consider whether advocates of the searching and matching approach are committed to the view that labour markets are emergent, causal, processual, historical and open systems, it will be helpful to add a further example. Whilst Pissarides model is useful in exploring the centrality of wage and Beveridge curves, I want to add an example showing how the process of searching is modelled mathematically. Consider the following from Rogers *et al* (2005: 961-2) who model a single agent looking for a job.

Consider an individual searching for a job in discrete time, taking market conditions as given. She seeks to maximize \mathbb{E} where

$$\mathbb{E} = \beta^t x_t,$$

where $\beta \in (0,1)$ is the discount factor, x_t is income at t , and \mathbb{E} denotes the expectation. Income is $x = w$ if employed at wage w and $x = b$ if unemployed. Although we refer to w as the wage, more generally it could capture some measure of the desirability of the job, depending on benefits, location, prestige, etc., and although we refer to $b > 0$ as unemployment insurance (UI), it can also include the value of leisure or home production.

We begin with the case where an unemployed individual samples one independently and identically distributed offer each period from a known distribution $F(w)$. If an offer is rejected, the agent remains unemployed that

period...For now we assume that if a job is accepted the worker keeps it forever. Hence, we have the Bellman equations²⁰

$$(1) W(w) = w + \beta W(w)$$

$$(2) U = b + \beta \int_0^\infty \max \{U, W(w)\} dF(w)$$

where $W(w)$ is the payoff from accepting a wage w (W stands for working) and U is the payoff from rejecting a wage offer, earning b , and sampling again next period (U stands for unemployed).

Since $W(w) = w/(1 - \beta)$ is strictly increasing, there is a unique w_R , called the *reservation wage*, such that $W(w_R) = U$, with the property that the worker should reject $w < w_R$ and accept $w \geq w_R$ (we adopt the convention that he accepts when indifferent).

Substituting $U = w_R/(1 - \beta)$ and $W(w) = w/(1 - \beta)$ into (2), we have

$$(3) w_R = T(w_R) \\ \equiv (1 - \beta)b + \beta \int_0^\infty \max \{w, w_R\} dF(w)$$

The function T is easily shown to be a contraction, so there is a unique solution to $w_R = T(w_R)$. This implies that if one fixes w_0 and recursively defines $w_{N+1} = T(w_N)$, the sequence converges to w_R as $N \rightarrow \infty$. If the initial wage is $w_0 = b$, the worker's reservation wage in the final period of a finite horizon problem, w_N has the interpretation of being the reservation wage when N periods of search remain, after which the worker receives either b or the accepted wage w forever. The optimal search strategy is completely characterized by (3)

So, can the searching and matching approach be interpreted as demonstrating a commitment, even at a very superficial level, to the view that labour markets are causal, emergent, processual, historical and open systems? The most straightforward answer would be to say 'no', and leave it at that. And, as we will see below, there would be good reasons for saying this. If, however, we deploy a more charitable interpretation, we end up with a different, and more sophisticated, answer. Let us, then, be a little more charitable.

Two things are immediately worth noting. First, advocates of the searching and matching approach do not use phraseology like 'causal, emergent, processual, historical and systemically open'. Second it is possible to be committed to something, even if this commitment is based upon a very superficial level of understanding. Consider some, typical, comments:

²⁰ The Bellman equations are simplified by removing time subscripts.

Early on, theorists realized that a dynamic “flows approach” was needed for an adequate analysis of unemployment fluctuation (Mortensen 2011: 1074-5).

A basic tenet of the searching and matching approach is that to explain the current stock of unemployment it is necessary to fully account for both the inflows into the unemployment pool and the outflows from it....The hallmark of much of this revolutionary new literature is the emphasis placed on the frictions that inhere in the process of trade between workers and firms. A natural source of these frictions is imperfect information (Laing 2010: 801).

The matching function is the lynchpin of searching and matching models of the labour market. But when workers and firms have to engage in a costly and time-consuming process of search to find each other, the matching function captures the technology that brings them together (Stevens 2007: 847).

One feature shared by all these [i.e. non searching and matching] models is that they are static. They explain how real wages and employment respond to shocks in a comparative-static framework but say nothing about the adjustment path from one equilibrium to the next. Also, the models say nothing about job vacancies, either in equilibrium or during the adjustment process. By contrast, this paper takes the view that by modelling job vacancies explicitly, one can learn more about the behaviour of unemployment and real wages, both in equilibrium and during the adjustment to equilibrium. Thus, the model developed below is explicitly dynamic, and in it job vacancies play a critical role in the transmission of output shocks to real wages and unemployment (Pissarides 1985: 676).

The idea is that the job search underlying unemployment in the official definitions is not about looking for a good wage, but about looking for a good job match. Moreover, it is not only the worker who is concerned to find a good match, with the firm passively prepared to hire anyone who accepts its wage offer, but the firm is also as concerned with locating a good match before hiring someone.

The foundation for this idea is that each worker has many distinct features, which make her suitable for different kinds of jobs. Job requirements vary across firms too, and employers are not indifferent about the type of worker that they hire, whatever the wage. The process of matching workers to jobs takes time, irrespective of the wage offered by each job (Pissarides 2011: 1093).

As the models above (Pissarides and Rogers *et al*) illustrate, agents are engaged in a continual process of searching, finding, accepting, and being matched; all this is subject to frictions generated (presumably) by ‘institutions’; models are set in discrete or continuous time; agents transform their state – e.g. from unemployed to employed or from unskilled to skilled; unemployment stocks and rates evolve; even a steady-state unemployment rate is based upon continual changes in inflows and outflows; jobs are interpreted as assets, delivering an income stream over time; Bellman equations deal with

dynamic decision problems by expressing the value of a decision at time t , in terms of the payoff from initial choices plus the values created by the future decisions resulting from initial choices. Advocates of the searching and matching approach constantly compare their 'dynamic' models to other 'static' models.

I interpret advocates of the searching and matching approach, therefore, as being committed to something approaching the view that labour markets are causal, emergent, processual, historical and open systems, *albeit at a very superficial level*. Their problem is not that they are not so committed, but that they *cannot deliver on this commitment*. To see why not, let us re-visit the summary of social systems as emergent, causal, processual, historical and open from the introduction and work through it, establishing why advocates of the searching and matching approach cannot deliver on their commitment point by point. This section will also explain why methodological individualism, rational maximization and equilibrium are retained.

Re-visiting emergent, causal, processual, historical and open systems

To avoid any confusion, the following (italicized) sentence precedes all the following bullet points. *In mainstream labour economics, exemplified by the the searching and matching approach:*

- Labour market agents are *not* engaged in an on-going process of drawing unconsciously and/or consciously upon socio-economic phenomena, and in the process, reproducing or transforming it. There are two reasons for this. First, rational economic man cannot act unconsciously, only consciously – i.e. maximizing choices are fully conscious choices. Second, labour economic agents cannot, even when acting consciously, draw upon socio-economic phenomena (or 'institutions') because these phenomena do not, or should not exist in models based upon methodological, and thereby ontological, individualism. I will say more about this below.
- Without socio-economic phenomena to engage with, mainstream labour economists cannot explain how labour market agents actually manage to take any social action whatsoever. A language speaker could not, for example, string even a couple of words together to form an intelligible sentence without engaging (typically unconsciously) with socio-economic phenomena in the form of the rules of grammar. A job-searcher could not even buy a newspaper to look for job vacancies without interacting with the newsagent and, therefore, engaging (consciously and/or unconsciously) with socio-economic phenomena.

Mainstream labour economists half grasp this. For example, they accept the existence of socio-economic phenomena such as the decision rule 'whenever $w \geq w_R$ accept job offer'. Notice, however, that these are *precise rules, consciously understood, and precisely followed*. There may be rare cases where real agents really do deliberate over rules like this, but they do not engage in this kind of conscious deliberation constantly because they would be paralyzed by the sheer number of decisions. This is why the use of precise decision rules is defended not on the grounds of realism, but on the grounds of tractability – they form the basis for algorithms. Mainstream labour economists invoke the 'as if' assumption: it is 'as if' agents follow a decision

rule. This assumption is, of course, (knowingly) unrealistic. But what about those cases where agents follow what we might call *'rules of thumb'*? Rules of thumb may be *unconsciously understood and loosely followed*, like norms, mores and values. Or they may be *consciously* understood and loosely followed, like agreements, codes, conventions, obligations, precedents and procedures. No-one seriously doubts the existence of these social phenomena, not even mainstream labour economists. Unfortunately for them, however, the commitment to rational economic man, who cannot act unconsciously, leaves mainstream labour economists unable to explain how agents interact with social phenomena, other than by reducing them to precise rules, consciously understood, and precisely followed.

Why, then, do mainstream labour economists not simply alter their conceptual apparatus and include things like rules of thumb, unconsciously understood and loosely followed. The answer is because these rules are not mathematically tractable. Consider two examples.

First, let us allow an agent to act on the basis of something like a semi-conscious habit. Imagine that the job-searcher is a young woman, and one of the jobs on offer is for a brick-layer. It is highly likely that this young woman will reject this job without even giving a second thought to whether $w \geq w_R$. This is because of the largely semi-conscious, gendered habits, caused by her internalizing stereotypes about *'men jobs'* and *'women's job'*. In this case, the decision rule would have to be re-styled along the following lines: *'sometimes when $w \geq w_R$ accept job offer'*. The problem this raises for mathematical modelling is that it is impossible to apply deductive logic to a model containing the term *'sometimes'*. Introduction of the term *'sometimes'* (or something similar) would transform the closed system into an open system.²¹

Second, let us abstract from unconscious habit, and allow the agent the power or capacity to reflect and the freedom to choose *not* to follow the fixed rule. Let us allow the agent to reflect upon what Rogers *et al* (2005: 3) refer to as the *'desirability of the jobs'* on offer and use this reflection as part of the decision to accept or reject the offer. In this case, the decision rule would have to be re-styled along the following lines: *'when $w \geq w_R$ and when the job is desirable, accept job offer'*. The problem this raises for mathematical modelling is that it is impossible to apply deductive logic to a model containing the phrase *'when it is desirable'*. Introduction of this phrase (or something similar) would transform the closed system into an open system.

In both of these examples, the presumption that all decision rules are precise rules, consciously understood, and precisely followed, is a necessary requirement of the assumption that agents are rational maximizers. This presumption and this

²¹ Attempts to deal with this via fuzzy logic and Boolean approaches create their own problems vis-à-vis probability. In any case, probabilistic or statistical event regularities, causality, laws and closed systems are all still event regularities, causality, laws, and closed systems.

assumption, prevent problems for mathematical modelling from arising in the first place.

The feature in all this that warrants emphasis (and tends to be overlooked) is that the primary purpose of any rationality axiom is just to fix individual behaviour in some way to render it atomistic and so tractable. The precise (set of) assumption(s) whereby this is done is secondary to this requirement (Lawson 2013: 976-7).

The presumption that all decision rules are precise rules, consciously understood, and precisely followed, and that agents are rational maximizers, (a) illustrates a failure to display a commitment to labour markets as causal, emergent, processual, historical and open; (b) illustrates a failure to deliver on their commitment to realism; and (c) are necessary consequences of mathematical modelling, and cannot be abandoned without abandoning mathematical modelling.

- Without socio-economic phenomena, mainstream labour economists are unable to explain what kind of 'stuff' labour markets are made of, or *constituted* by – other than to say that they are made of, or constituted by curves or functions. Neither can they explain how labour markets emerge in the first place – a set of curves or functions did not just materialize one day.
- Without socio-economic phenomena it is unclear how labour market agents reproduce or transform themselves as labour market agents (e.g. as job searchers, worker-searchers, unemployed, skilled, low-paid, discouraged etc.) and continue their existence into the future.
- Without socio-economic phenomena that *transform*, not just reproduce labour markets, mainstream labour economists cannot explain transience, evolution or change – other than in terms of change or evolution of the *magnitude of variables*. There is no way in which a specific category of workers searching for jobs in one time period can be transformed (a) due to changes in the socio-economic phenomena they engage with – because either there is none, or because they cannot influence agents (immaculately conceived) preferences; and/or (b) due to changes in their thinking – i.e. evaluations, interpretations, expectations, because rational maximizing agents do not evaluate or interpret, and any changes in expectations are assumed to be already known.
- Without socio-economic phenomena labour markets have to be modelled without transformation, evolution and change. We have to tread carefully because, as noted above, the searching and matching approach appears to allow transformation, evolution and change. Agents are engaged in a continual process of searching, finding, accepting, and being matched; all this is subject to frictions generated by 'institutions'; models are set in discrete or continuous time; agents transform their state – e.g. from unemployed to employed, unskilled to skilled, or from young to old; unemployment stocks and rates evolve; even a steady-state unemployment rate is based upon continual changes in inflows/outflows into/out of unemployment. The technique of asset evaluation makes the present values of key variables dependent upon the

expected future value stream, allowing for historical changes. The use of Bellman equations allow economists to deal with dynamic decision problems –i.e. they keep track of future developments by expressing the value of a decision at time t , in terms of the payoff from initial choices at t , plus the values created by the future decisions resulting from the initial choices. The snag with these kinds of conception of transformation, evolution and change is that they are one-dimensional: they are all quantitative. Variables increase or decrease in magnitude, over time, but they do not undergo *qualitative* transformation, evolution and change.

Consider the example given by Rogers *et al* (above) of the present value of a payoff U resulting from rejecting the job and earning only unemployment insurance b . Including the discounted value of unemployment insurance over multiple periods looks, superficially, like it is being modelled in time. But nothing about unemployment insurance changes qualitatively as time passes – apart from its magnitude. Things like eligibility criteria, coverage or political discourse that influence decisions about claiming unemployment insurance cannot be allowed to change in the model. Unemployment insurance at the end of the modelling period is qualitatively no different to what it was in the first period. Important developments in political power or political discourse cannot therefore, be (meaningfully) addressed. The various mathematical techniques used to make variables comparable over time, simply collapse the future values of variables into the present values of variables, presuming, therefore, that the things these variables represent undergo no qualitative transformation, change or evolution. This example (a) illustrates a failure to display a commitment to labour markets as causal, emergent, processual, historical and open; (b) illustrates a failure to deliver on their commitment to realism; and (c) are necessary consequences of mathematical modelling, and cannot be abandoned without abandoning mathematical modelling.

- A caveat. Labour markets can be modelled with transformation, evolution and change, but only if knowingly unrealistic assumptions are made. For example, qualitative changes in unemployment insurance (e.g. changes in eligibility criteria, coverage or political discourse) could be modelled, by making assumptions about the future states, and fixed decision rules pertaining to them. The problem is that fixed decision rules are problematic – for the reasons discussed above.²² It is against this that rational expectations, assumed in almost all searching and matching models, should be interpreted. The innocuous expectations operator \mathbb{E} is slipped in and (depending upon the version of rational expectations assumed) effectively takes care of any future unforeseen transformation, evolution and change.
- Generally speaking, mainstream labour market models must be devoid of transformation, evolution and change in order to ensure that they display event regularities, laws or law-like relationships and, therefore, systemic (theoretical) closure (Fleetwood, 2001, 2014).

²² Again we come across the issue of *meaningful* measurement of something like political discourse – see footnote 15.

- Mainstream labour market models without transformation, evolution and change 'fit' with the conception of causality based upon event regularities, as in the regularity view of causation and the regularity view of law. Not only is there no need to introduce conceptions of causality based upon powers and tendencies, they could not be accommodated anyway due to the commitment to mathematical modelling.
- Labour market agents cannot be modelled as *inter-acting* with other agents *via social phenomena* – which, causally govern, but do not determine, their preferences. Rather, labour market agents have to be modelled as isolated atoms, driven by immaculately conceived preferences; and pre-programmed with one and only one imperative: to consciously maximize some objective function.²³ This explains the commitment to methodological individualism. According to one mainstream labour economist:

Methodological Individualism. This is the view that human social behaviour can be explained by understanding the behaviour of the individual decision makers within a group...Given that methodological individualism is a central pillar of the approach, it is evident that a satisfactory model of human behaviour must be furnished in order to make further progress. (Laing 2011: 23).

The basic tenet of methodological individualism is that reasoning should proceed from the (rational) individual, with 'given' preferences, who formulates plans and initiates actions. Methodological individualism is, however, intelligible *only* on the presupposition of *ontological* individualism, the basic tenet of which is that *all* that exists are individuals, their preferences and their actions. Any social phenomena or 'institutions' (e.g. trade unions) are merely the outcome of individuals acting or interacting. Taken together, methodological and ontological individualism imply that the basic unit of analysis, along with the *well-spring, the initial urge, the motive force, the first cause, the uncaused cause or ultimate cause*, of all labour market activity are individuals' preferences. Labour market institutions are not causally efficacious, but are themselves ultimately caused by individuals' preferences.

The moment mainstream labour economists allow things like 'institutions' (or socio-economic phenomena) into the model, they introduce the possibility that these 'institutions' might influence agents' plans and actions in ways that cause agents to take unpredictable, and therefore, not-deducible, actions. Consider the following entirely realistic example. Suppose we allow *social stigma* into the model. We can no longer ensure that all agents will reject the job offer if $w < w_R$. An agent might accept the job even if $w < w_R$ because they believe they will be stigmatized if they reject it, due to the government attacking 'dole scroungers'. In this case, the decision rule would have to be re-styled along the following lines: 'if $w < w_R$, reject the job offer - unless you feel this might stigmatize you. The problem this raises for mathematical

²³ This raises the issue of rational-choice, and game-theoretic models, that claim precisely to model inter-agential action. I cannot elaborate here, except to say that they too cannot get beyond assuming decision rules are conscious rules, precisely understood and followed, and are caught in the contradiction of committing to both the existence of rules, and to methodological individualism where rules should not exist.

modelling is that it is impossible to apply deductive logic to a model containing the phrase 'unless you feel this might stigmatize you'. Introduction of this phrase (or something similar) would transform the closed system into an open system. By ignoring all socio-economic phenomena (like social stigma) and building a model *containing only agents themselves*, methodological and ontological individualism ensures systemic closure.

Methodological and ontological individualism are necessary consequences of mathematical modelling, and cannot be abandoned without abandoning mathematical modelling. Laing is entirely correct to say that 'a satisfactory model of human behaviour must be furnished in order to make further progress'. But the commitment to methodological and ontological individualism, with agents as isolated atoms, (as noted above) unable to engage with social phenomena is a most unsatisfactory model of human behaviour.

- For the concept of equilibrium, Lawson, makes the point succinctly and without need of much elaboration.

[I]n the context of modern economics especially, equilibrium is basically a solution concept, given a system of equations. Where such a system is generated under deductivist thinking, a question that can in some contexts be meaningfully addressed is whether the resulting set of equations are mutually consistent. Is there a vector of values consistent with them all? The solution concept, especially where prices are involved, is often called an equilibrium state; when economists enquire whether an equilibrium state exists, they are merely inquiring as to whether a set of equations has a solution (see Lawson, 2005, 2006b). In this manner we can understand why, at least from a mathematical point of view, such a concern may be of interest, and thereby we can explain the (former) high frequency of appearance of the category equilibrium in the economics literature.

Demonstrating that a set of equations has a solution is, clearly, not the same as demonstrating that real labour markets are in equilibrium. Given that mainstream labour economists do not, typically, set out to construct a set of equations that do *not* have a solution and, therefore, equilibrium, then the latter must be considered to be a necessary consequence of mathematical modelling, and cannot be abandoned without abandoning mathematical modelling.

Pause to take stock

Whilst advocates of the searching and matching approach are committed to something approaching the view that labour markets are causal, emergent, processual, historical and open systems, albeit at a very superficial level, their problem is they *cannot deliver on this commitment*.

Conclusion

This chapter has demonstrated the value of following Lawson's (2013) lead, and insisting upon re-locating discussion of the term 'neoclassical' from the level of *substantive* theory

to the level of *meta-theory*. This allowed me to reveal the mismatch between the desire to be realistic at the level of substantive theory, and the inability to be realistic because of particular meta-theoretical commitments. More precisely, I used the search and matching approach to show that contemporary mainstream labour economics is characterized by: (α) a commitment to the view (at a very superficial level) that labour markets are emergent, causal, processual, historical and open systems, but they cannot deliver on this commitment; and (β) a commitment to building realistic models, but they cannot deliver on this commitment either. The reason they cannot so deliver is due to their commitment to mathematical modelling. If we want to build realistic models of labour markets as emergent, causal, processual, historical and open systems, then we will have to abandon the commitment to mathematical modelling.

Diagrams

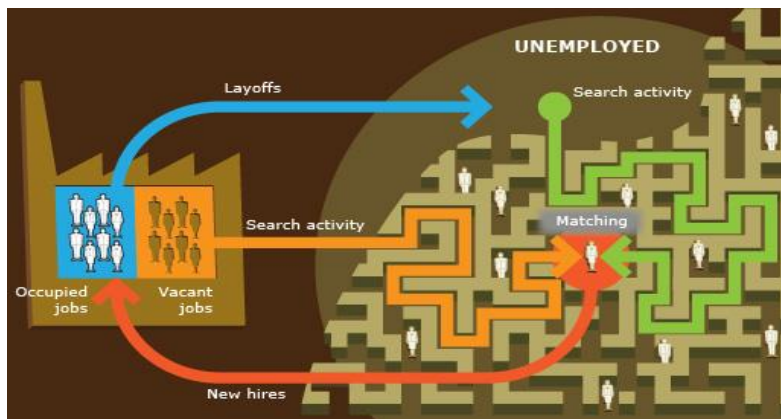


Figure 1. A schematic overview of searching and matching

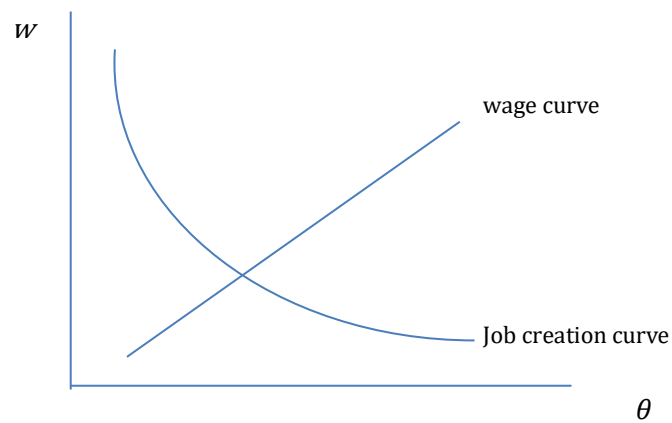


Figure 2. Equilibrium wages and market tightness (Pissarides 2000: 19).

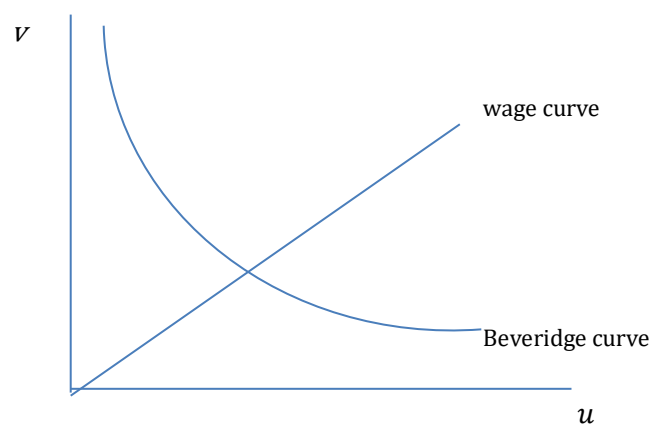


Figure3. Equilibrium vacancies and unemployment (Pissarides 2000: 20).

References

- Addison & Siebert (1979) *The Market for Labour: An Analytical Treatment*, Los Angeles, Goodyear/Scott Foresman.
- Ashenfelter, O. Layard, R. (1986a) *Handbook of Labour Economics*, Vol 1, Amsterdam: Elsevier.
- Ashenfelter, O. Layard, R. (1986b) *Handbook of Labour Economics*, Vol 2, Amsterdam: Elsevier.
- Ashenfelter, O. Card, D. (1999a) *Handbook of Labour Economics*, Elsevier, Vol 3, part A, Amsterdam: Elsevier.
- Ashenfelter, O. Card, D. (1999b) *Handbook of Labour Economics*, Elsevier, Vol 3, part B, Amsterdam: Elsevier.
- Ashenfelter, O. Card, D. (1999c) *Handbook of Labour Economics*, Elsevier, Vol 3, part C, Amsterdam: Elsevier.
- Ashenfelter, O. Card, D. (2011) *Handbook of Labour Economics*, Elsevier, Vol 4, part A, Amsterdam: Elsevier.
- Backhouse, R. (2002) 'Economic Models and Reality: The Role of Informal Scientific Methods', in Mäki, U. *Fact and Fiction in Economics*, Cambridge: Cambridge University Press.
- Bauman, M. Davis, J. (2010) *Economic Methodology: Understanding Economics as a Science*, Basingstoke: Palgrave Macmillan.
- Blanchard, O. Galí, J. (2010) 'Labour Markets and Monetary Policy: A New Keynesian Model with Unemployment', *American Economic Journal: Macroeconomics*, No. 2, 1-30.
- Boeri, T. van Ours, J. (2008) *The Economics of Imperfect Labour Markets*, Princeton: Princeton University Press.
- Booth, A. (1995) *The Economics of Trade Unions*, Cambridge: Cambridge University Press.
- Borjas, G. (2010 10th ed) *Labour Economics*, New York: McGraw-Hill.
- Borjas, G. (2014) *The Economics of Labour*, London: Routledge.
- Bosworth, D. Dawkins, P. Stromback, T. (1996) *The Economics of The Labour Market*, Harlow: Addison Wesley Longman.
- Cahuc, P. Zylberberg, A. (2004) *Labour Economics*, Massachusetts: MIT Press.
- Card, D. Ashenfelter, O. (2011) *Handbook of Labour Economics*, Elsevier, Vol 4, part B, Amsterdam: Elsevier.
- Coleman, W. (2010) *The Political Economy of Wages and Unemployment: A Neoclassical Exploration*, Basingstoke: Edward Elgar.
- D'Auria, F. Denis, C. Havik, K. McMorro, K. Planas, C. Raciborski, R. Roger, W. Rossi, A. (2010) 'The Production Function Methodology for Calculating Potential Growth Rates and Output Gaps', *Economic Papers*, 420, July.
- Ehrenberg, R. Smith, R. 2009. *Modern Labour Economics: Theory and Public Policy*, Boston: Pearson, Addison Wesley.
- Elliot, R. (1991) *Labour Economics: A Comparative Text*, London: McGraw-Hill.
- Esteban-Pretel, J. Fujimoto, J. (2014) 'Life-Cycle Labour Research with Stochastic Match Quality', *International Economic Review*, Vol. 55, No. 2, 575-599.
- Fallon, P. Verry, D. (1988) *The Economics of Labour Markets*, New York: Phillip Allen.
- Ferandez-Blanco, J. (2013) 'Labour Market Equilibrium with Rehiring', *International Economic Review*, Vol. 54, No. 3, 885-914.

- Fleetwood, S. (2014) 'Do Labour Supply and Demand Curves Exist?', *Cambridge Journal of Economics*, Vol. 38, No. 4, 1-27.
- Fleetwood, S. (2012) 'Laws and Tendencies in Marxist Political Economy', *Capital & Class*, 36 (2): 235-262.
- Fleetwood, S. (2011a). 'Sketching a Socio-Economic Model of Labour Markets', *Cambridge Journal of Economics*, 35 (1): 15-38.
- Fleetwood, S. (2011b) 'Powers and Tendencies Revisited', *Journal of Critical Realism*, Vol. 10, No.1, 80-99.
- Fleetwood, S. (2009) 'The Ontology of Things, Powers and Properties', *Journal of Critical Realism*, Vol. 8, No. 3, 343-366.
- Fleetwood, S. (2008a) 'Institutions and Social Structures', *Journal for the Theory of Social Behaviour*, 38 (3): 241-265.
- Fleetwood, S. (2008b) 'Structure, Institution, Agency, Habit and Reflexive Deliberation', *Journal of Institutional Economics*, 4 (2): 183-203.
- Fleetwood, S. (2006) 'Re-thinking Labour Markets: A Critical Realist-Socioeconomic Perspective', *Capital & Class*, 89: 59-89.
- Fleetwood, S. (2001) 'Conceptualising Unemployment in a Period of Atypical Employment: A Critical Realist Analysis', *Review of Social Economy*, Vol. LIX, No.1, 211- 220;
- Fleetwood, S. (1999) 'The Inadequacy of Mainstream Theories of Trade Unions', *Labour*, 13 (2): 445-80.
- Garibaldi, P. (2006) *Personnel Economics in Imperfect Labour Markets*, Oxford: Oxford University Press.
- Hall, R. (2005) 'Employment Fluctuations with Equilibrium Wage Stickiness', *The American Economic Review*, Vol. 95, No. 1, 50-65.
- Hamermesh, D. (1993) *Labour Demand*, Princeton: Princeton University Press.
- Hicks, J. (1932) *The Theory of Wages*, London: Macmillan.
- Hodgson, G. (2003) 'The Hidden Persuaders: Institutions and Individuals in Economic Theory', *Cambridge Journal of Economics*, Vol. 27, 159-75.
- Hodgson, G. (2014) 'What is Capital? Economists and Sociologists Have Changed Its Meaning: Should It Be Changed Back?', *Cambridge Journal of Economics*, Vol. 38, No. 5, 1063-1086.
- Hyclack, T. Johnes, G. Thortnton, R. *Fundamentals of Labour Economics* (2013 2nd ed) South Western: Ohio.
- Kaufman, B. Hotchkiss, J. (2006) *The Economics of Labour Markets and Labour Relations*, Mason: Thompson South-Western.
- Killingsworth, M. (1983) *Labour Supply*, Cambridge: Cambridge University Press.
- King, J. (1990) *Labour Economics*, Basingstoke: Macmillan.
- Laing, D. (2011) *Labour Economics: Introduction to Classic and the New Labour Economics*, New York: Norton.
- Kwon, H-S (2014) 'Economic Theories of Low-Wage Work', *Journal of Human Behavior in the Social Environment*, 24:61-70, 2014
- Lawson, T. (1997) *Economics and Reality*, London: Routledge.
- Lawson, T. (2013) 'What is This "School" Called Neoclassical Economics?', *Cambridge Journal of Economics*, No. 37, 947-983.
- McConnell, C. Brue, S. Macpherson, D. (2006) *Contemporary Labour Economics*, Boston: McGraw-Hill, Irwin.

- Manning, A. (2003) *Monopsony in Motion: Imperfect Competition in Labour Markets*, Princeton: Princeton University Press.
- Marsden, D. (1999) *A Theory of Employment Systems: Micro-Foundations of Societal Diversity*, Oxford: Oxford University Press.
- Morgan, M. (2012) *The World in the Model: How Economists Work and Think*, Cambridge: Cambridge University Press.
- Mortensen, D. (2011) 'Markets with Search Friction and the DMP Model', *American Economic Review*, No. 101, 1073–1091.
- Mendes, R. van den Berg, G. Lindeboom, M. (2010) 'An Empirical Assessment of Assortative Matching in the Labour Market', *Labour Economics*, No. 17, 919–929.
- Petridis, R. (1999) 'Neoclassical Economics', in P. O'Hara, *Encyclopedia of Political Economy*, Volume 2, London: Routledge.
- Pissarides, C. (1985) 'Short-Run Equilibrium Dynamics of Unemployment, Vacancies, and Real Wages', *The American Economic Review*, Vol. 75, No. 4, 676-690.
- Pissarides, C. (2000) *Equilibrium Unemployment Theory*, Massachusetts: MIT Press.
- Pissarides, C. (2011) 'Equilibrium in the Labour Market with Search Frictions', *American Economic Review*, No. 101, 1092–1105.
- Reynolds, L. Masters, S. Moser, C. (1998) *Labour Economics and Labour Relations*, New Jersey: Prentice-Hall.
- Rogerson, R. Shimer, R. Wright, W. (2005) 'Search-Theoretic Models of the Labour Market: A Survey', *Journal of Economic Literature*, Vol. XLIII, 959–988.
- St Paul, G. (2000) *The Political Economy of Labour Market Institutions*, Oxford: Oxford University Press.
- Smith, S. (2009) *Labour Economics*, London: Routledge.
- Stevens, M. (2007) 'Microfoundations for the Aggregate Matching Function', *International Economic Review*, Vol. 48, No. 3, 847-868.
- Sloane, P. Latreille, P. O'Leary, N. (2013) *Modern Labour Economics*, London: Routledge.
- Tilly, C. Tilly, C. (1998) *Work Under Capitalism*, Boulder Colorado: Westview Press.
- Sutton, J. (2000) *Marshall's Tendencies: What Can Economists Know?* Massachusetts: MIT Press.
- Zanetti, F. (2011) 'Labour Market Institutions and Aggregate Fluctuations in a Searching and matching Model', *European Economic Review*, No. 55, 644–658.