

Do Labour Supply and Demand Curves Exist?¹

Abstract. The objective of this paper is to show that circumstantial and empirical evidence for the existence of labour supply and demand curves is at best inconclusive and at worst casts doubt on their existence. Because virtually all orthodox models of labour markets, simple and complex, are built upon the foundation stones of labour supply and demand curves, these models lack empirically supported foundations. Orthodox labour economists must, therefore, either provide stronger evidence, or stop using labour supply and demand curves as the foundation stones of their models. The conclusion discusses implications for future orthodox and heterodox labour economics.

Introduction

Pick up any orthodox labour economics textbook, and comments like the following are readily available:

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 (Smith 2003: 2).

[The labour market is] the 'place' where labour supply and labour demand come together, to determine the prices and quantities of labour services exchanged (Bosworth *et al* 1996:3).

Simple, and as we will see below, complex models of labour markets rest on the twin foundation stones of *labour supply and demand functions or curves*. Given the theoretical and practical weight placed upon these foundations one could be forgiven for assuming that the empirical evidence for the existence of labour supply and demand curves is overwhelming. This is not the case. In fact, as this paper demonstrates, *circumstantial and empirical evidence for the existence of labour supply and demand curves is at best inconclusive and at worst, casts doubt on their existence.*² This has not escaped the notice of one *Nobel Prize*-winning labour economist, who writes: 'the currently orthodox view of the labour market rests on rather weak evidence and ought to be viewed with healthy skepticism (Solow 1990: 60). This paper heeds Solow's words and puts a 'healthy skepticism' into practice.

The paper has six parts plus a conclusion. Part one shows that labour supply and demand curves, and their *alter ego*, the *laws* of labour supply and demand, are presumed to be law-like and causal. The confusion between laws and tendencies is attended to. Part two establishes that even complex models, i.e., those containing what orthodox labour economists refer to as 'institutions',³ nevertheless rest on the

¹ I wish to thank Dave Spencer, Brian O'Boyle and, in particular, an anonymous referee for exceptionally insightful comments on earlier drafts of this paper.

² This does not mean that wage rates *never* respond to changes in quantities of labour supply and demand - or *vice versa*. A large and sudden change in wage rates would almost certainly cause changes in quantities. But such a change would not be due to wage rates and labour supply and demand being functionally related. Indeed, this would appear as 'jumps' between Euclidean coordinates caused, ultimately, by a seismic 'shock' from 'institutions'. Explanation would lie outside economic theory.

³ See Fleetwood (2008 a & b, 2010), and Hodgson (2003, 2006) for definitions, and comments on the uses and misuses of the term 'institutions' – and other social phenomena. I stick with it here, but place it in scare quotation marks.

foundations of labour supply and demand curves. Part three, an *ontological* enquiry into the broad nature and structure of the social world in general, and labour markets in particular, generates *circumstantial evidence* casting doubt on the existence of labour supply and demand curves. Part four shows that orthodox labour economists do not actually carry out empirical research specifically designed to corroborate, or refute, the existence of labour supply and demand curves. This leaves them caught on the horns of a dilemma. If they fail to carry out such empirical research, they stand accused of building models with knowingly unsupported foundation. But this is not the whole story because they do carry out empirical research on labour supply and demand *elasticities*. Whilst research designed to estimate elasticities is not the same as research designed to corroborate, or refute, the existence of labour supply and demand curves, it can, with some finessing, be interpreted as evidence for their existence. Whilst this avoids the previous accusation, it impails orthodox economists on the other horn of the dilemma: empirical evidence for the existence of labour supply and demand curves, derived from estimates of elasticities, is at best inconclusive and at worst casts doubt on their existence. Parts five (supply) and six (demand) concentrate on this empirical evidence. What I do not do, however, is offer empirical counter-evidence. I do not, for example, run regressions on quantities of labour supplied and demanded, and wage rates, in order to show that there is *no* statistical association between them. Rather, I use exactly the same research on labour supply and demand elasticities, but interpret it with Solow's 'healthy skepticism'. Where, for example, orthodox labour economists report low, or even zero, elasticities of supply for men, and then move swiftly on, as if this is unimportant, I interpret this as evidence *against* the existence of labour supply curves for men. Whilst part six makes similar arguments vis-à-vis elasticities as part five, it makes a foray into the 'capital controversy' to show that estimating labour demand elasticities is tantamount to estimating identities. As a result, it is virtually impossible to obtain anything *other* than negative, significant and relatively high elasticities. The conclusion briefly discusses the implications of the above for future orthodox and heterodox labour economics.

1. Causality, laws and tendencies

Labour supply and demand curves are deductions from, and/or predictions of, the (well known) *theories* of labour supply and demand. They express *precise* and *unambiguous* relationships between quantities of labour services supplied and demanded, and wage rates, and hence are often referred to as the *laws of labour supply and demand*.⁴ Because orthodox labour economists presume these relationships are *law-like*, and *causal*, the concept of *causal law* describes them perfectly.

Consider law-likeness. Suppose orthodox labour economists presumed that relationships between labour supply and demand, and wage rates, were *not* law-like, but (let us say) idiosyncratic and accidental. In this case it would make no sense to try and deduce or predict that labour demand would decrease following an increase in wage rates, *ceteris paribus*. The fact is, however, orthodox labour economists frequently make such deductions and predictions. And making them is intelligible only on the presumption that these relationships are *law-like*.

Now consider causality. Suppose orthodox labour economists presumed that relationships between labour supply and demand, and the wage rate, were *not* causal. In this case, it would make no sense to try and deduce or predict that an increase in wage rates would *cause* a decrease in labour demand, *ceteris paribus*. The fact is, however, orthodox labour economists frequently make such deductions and

⁴ There are many law-like relations in economics not usually referred to as 'laws', but this is a mere semantic issue - e.g. production functions.

predictions. And, once again, making them intelligible only on the presumption that these relationships are *causal*. But what conception of causation is at work here?

The conception of causation at work here is known as the *regularity view of causation*. The conception of law at work here is known as the *regularity view of law* whereby 'laws of nature are regularities' (Psillos 2002: 137) or more specifically, *event* regularities. The laws of labour supply and demand are, therefore, based upon regularities between changes in the supply and/or demand for labour (events) and changes in wage rates (events). The laws of labour supply and demand, or labour supply and demand curves, are based upon event regularities.

Tendencies

Lest there be any confusion, allow me to deal with the way the term 'law' is sometimes substituted with the term 'tendency' - as in the following comment:

that there is a *tendency* for firms to reduce employment when wages increase and shift relative employment towards workers who become relatively less expensive is undeniable (Hamermesh 1993: 58, emphasis added).

The 'tendency for firms to reduce employment when wages increase', translates to: (a) 'firms decrease their demand for labour when wages increase, albeit (b) not with strict regularity.' Part (a) is a reference to a labour demand curve, and part (b) is a reference to the curve or (better put) function, specified not deterministically, but *probabilistically*. A labour demand function specified probabilistically is an example of a *statistical law*. If Hamermesh is referring to a statistical law, then substituting the term 'tendency' for 'law', adds nothing except ambiguity.⁵

Let us return to the point. The well-known orthodox parable about the 'higgling and haggling' that takes place in labour markets and, therefore, about how resources are allocated efficiently, requires labour supply curves to be positive or upward sloping and labour demand curves to be negative or downward sloping.⁶ Whilst orthodox economists are perfectly aware that labour supply curves can be 'vertical', 'backward bending', and even 'inverted S-shaped' (Dessing 2008),⁷ these are considered to be *exceptions to the rule*. Indeed, if they were the rule, there would be no parable.

2. Institutions and more complex models

In the last couple of decades orthodox labour economists have gone further than ever in including 'institutions' in their models. Text-books now routinely mention 'institutions' and they occasionally feature in book-titles such as: *The Labour Market as a Social Institution* (Solow 1990); *The Political Economy of Labour Market Institutions* (St Paul 2000); and *The Third Dimension of Labour Markets: Demand, Supply and Institutions in Brazil* (Carneiro et al 2006:8). Blau & Kahn's (1999) 'Supply, Demand and Institutions' framework is now well-known and at least one textbook (Laing 2011) has a section on it. 'Institutions' involve complexity, and the:

⁵ He might be referring to a power, disposition or capacity but there is nothing in his work (or in the orthodox literature) indicating a metaphysics that would sustain such a conception. On tendencies and powers see Fleetwood (2009, 2011a, 2012).

⁶ I ignore the theoretical curiosum where labour supply and demand curves could be horizontal, perfectly elastic or have infinite elasticity.

⁷ Such permissiveness seems not to characterise labour demand curves.

complexity of labour markets means that the concepts of supply and demand must be substantially revised and reoriented when applied to labour markets....The point to be underscored is that understanding of labour markets presumes an appreciation of the special attributes of labour supply and demand. Unique institutional considerations...affect the functioning of labour markets and require special attention (McConnell *et al* 2006: 3).

Whilst no-one doubts that the complexity added by 'institutions' requires the concepts of labour supply and demand to be substantially revised and reoriented, it is important to note four things.

First, whilst orthodox labour economists are perfectly aware of the influence of 'institutions', they do *not* believe that this influence is strong enough to over-ride or negate the existence of labour supply and demand curves – extreme cases notwithstanding. They *do*, however, believe that the influence of 'institutions' is strong enough to alter the slope, intercept, or shape of labour supply and demand curves. A few examples should illustrate the point.

An institution like the minimum wage sets the lower bound w to the wage paid to the individual worker. By doing so, it changes the slope of the labour demand schedule (Boeri & van Ours: 14).

According to our definition, they [institutions] are outcomes of collective choice mechanisms that interfere with the exchange of labour services for pay. They do so by introducing a wedge between the reservation wage of the workers and the value of the job, that is, between the labour supply and demand schedules (Boeri & van Ours: 14).

Adjustment to a supply and demand equilibrium may be complicated by institutional factors, but we would nevertheless expect supply and demand to be major influences on labour market outcomes (Hyclak *et al* 2004: 19).

Second, when discussing models that reflect (some of) the complexity of labour markets, it is more accurate to refer not to *the* orthodox model, but to 'varieties' of orthodox models, with each 'variety' including slightly different 'institutions' - e.g. human capital models, efficiency wage models, searching and matching models, models with unions and so on.

Third, even the most complex orthodox models of labour markets either explicitly use labour supply and demand curves, or use concepts derived from them. I am not aware of any such models that *reject* the existence of labour supply and demand curves. I exemplify the point via a comment from a recent article in the *Journal of Labour Economics*, but many other examples are readily available.

The starting point is a simple model of dynamic monopsony...In the spirit of new monopsony theory, we regard the firm as a monopsonist in the sense that it faces an upward-sloping labour supply curve (Hirsch *et al*, 2010: 294).

Hirsch *et al*, then go on to present a labour supply function to the firm (*ibid*: equation 1).

Fourth, in recent years some orthodox labour economists have insisted on the need to construct models of labour markets on the assumption of imperfect competition or monopsony (e.g. Manning, Boeri & van Ours, and Hirsch *et al*, just noted). The key feature of this approach is its interpretation of labour supply curves.

The single most important idea of this book is that the wage elasticity of the labour supply curve (ϵ_{NW}) is not infinite or close to it (Manning 2003: 80).

Manning then introduces the concept of the labour supply curve *to the individual firm*. It is vital to note that Manning does not reject the existence of labour supply curves, he merely rejects claims that the elasticity of labour supply is infinite or close to it. In fact, he believes labour supply curves to be upward sloping with elasticities 'in the region of 2-5'.

To conclude this section, then, note that virtually all orthodox models of labour markets, from simple to complex, are built on the foundation stones of supply and demand curves.⁸

3. The ontology of labour markets and circumstantial evidence⁹

Ontology is a general enquiry into being, existence, or more simply the study of *the way the world is*. *Social* ontology is the general study of the way the *social* world is, and what we might call 'labour market ontology' is the general study of the way the labour market is, or labour markets are.

The starting point for *orthodox* labour economics is not, of course, ontology but epistemology, in the guise of a commitment to what they call 'the scientific method' - i.e. an under-elaborated version of the Deductive-Nomological (DN) and Inductive-Statistical (IS) models of explanation. What matters for our purposes, is the fact that these models work *iff* they include a law - deterministic in the DN model and statistical or probabilistic in the IS model. In order to even consider applying this method and these models, orthodox economists *must* be *presuming* that labour markets are characterised by laws, or law-like relations. In this way, laws implicitly enter into orthodoxy's labour market ontology. When orthodox labour economists first approach labour markets with a view to analysing them, they are already ontologically committed to the existence of the laws of labour supply and demand, or labour supply and demand curves.

The starting point for critical realists is a commitment to ontology, not to science or method. Indeed, critical realists tailor their methods to suit the object of enquiry. For critical realists, the social world in general, and labour markets in particular, are believed to be: *open systems; multiply caused, stratified, emergent, transformational, and subject to human agency interacting with a range of social phenomena* - all elaborated upon below. This ontology makes it more likely that the relations between labour supply and demand, and wage rates will be characterised by event *irregularity*; and less likely that labour supply and demand curves exist. When critical realist-oriented labour economists first approach labour markets with a view to analysing them, they are already ontologically committed to the *non*-existence of labour supply and demand curves.

Now, to the extent that ontology constitutes evidence, it is *circumstantial* and *inconclusive*. It is not like seeing the butler shoot the master, but more like establishing that the butler had a motive. Whilst we should not over-play circumstantial evidence we should not dismiss it either. If, for example, almost everything we know about the social world points to the conclusion that event regularities, or laws, do not

⁸ The conclusion discusses matching models where labour supply and demand curves are 'side-lined'.

⁹ This section assumes a degree of familiarity with critical realism. See Fleetwood (1999, 2001, 2006 and 2011b); Lawson *et al* (2007); Lawson (1997, 2003a, 2003b); and Lewis (2004).

exist, then we would be extremely foolish to ignore this when we turn our attention to labour markets. Let us look closer at this ontology of labour markets.

I will start by clarifying the meaning of 'open and closed systems' and 'social phenomena', before going on to reflect upon five key ontological concepts: multiple causality, stratification, emergence, transformation, agency and social phenomena. Rather than draw five individual conclusions, I will draw an overall sub-conclusion at the end of the section.

Open and closed systems

The *critical realist* concept of open and closed systems is simple, perhaps deceptively so. *Systems that display event regularities are closed; systems that do not display event regularities are open.* This is often styled as: 'whenever events $x_1, x_2, x_3 \dots x_n$, then event y '. They can be expressed as a mathematical function – deterministically as in (1) or stochastically or probabilistically as in (2).

$$(1) \quad y = f(x_1, x_2, x_3 \dots x_n)$$

$$(2) \quad h_{it} = a + b \ln w_{it} + u_{it}$$

Where h_{it} are hours of work and w_{it} is the post-tax hourly wage rate for an individual in financial year t . The error term u_{it} (Blundell *et al* 1999: 833).

To exemplify: if labour supply *regularly* increases following wage rises, then labour markets are *closed* systems; if labour supply *sometimes* decreases, *sometimes* increases and *sometimes* remains unchanged following wage rises, then labour markets are *open* systems.

Social phenomena

Many scholars nowadays accept that social activity is only possible because human agents interact with some kind of 'social stuff'. Economists refer to this 'stuff', generically, as 'institutions', and other social scientists refer to it as 'social structures' - or just 'structures'. But agents interact with far more than 'institutions' and 'structures'. They also interact with: *agreements, codes, conventions, customs, (legal) laws, mechanisms, mores, norms, obligations, organisations, precedents, procedures, regulations, routines, rules, rituals, and values.* I will, where possible, use the generic term 'social phenomena' to refer to them.

i) Multiple causality

Labour markets are *multiply caused*. Wage rates are caused by agents interacting with scores of social phenomena. For example, the gender wage gap is caused, *inter alia*, by the horizontal segmentation of labour markets by gender, which is itself caused, *inter alia*, by agents interacting with gendered norms and regulations.

Not only are there a large number of these social phenomena, each with differing levels of influence, they interact with one another to create complex causal chains. Orthodox labour economists know full well that wages are *multiply caused* by 'economic' factors such as productivity, education, training and 'non-

economic factors such as shirking or perceptions of fairness. But why stop there? The boundaries of the causal envelope do not stop conveniently at the boundaries of labour economics.¹⁰

ii) *Stratification*

Labour markets are *stratified*. Critical realists claim that the world is stratified into domains of the *empirical*, *actual* and (metaphoric) *'deep'*. Whilst the latter is sometimes referred to as the *'real'*, this (misleadingly) implies that the other domains are *'unreal'*. The term *'deep'* is not only less ambiguous, it also implies a domain that is difficult, or perhaps even impossible, to observe and investigate, at least without a process of excavation or uncovering. The *'deep'* includes all the social phenomena noted above.

Domain	Entity
Empirical	Experiences, perceptions & observations
Actual	Events & actions
'Deep'	Agreements, codes, conventions, customs, institutions, laws (legal), mechanisms, mores, norms, obligations, organisations, precedents, procedures, regulations, routines, rules, structures, rituals, precedents and values

Figure 1. A stratified ontology

Stratification refers to a distinction between what is empirically observed, what actually occurs, and what causes that which occurs - and may or may not be observed. Social phenomena in the *'deep'*, *causally govern, but do not determine, events and observations*. Gendered norms, for example, causally govern the actual horizontal segmentation of labour markets by gender which may, subsequently, be observed.

But, this horizontal segmentation is caused not only by agents interacting with gendered norms, but also interacting with, *inter alia*, gendered regulations. There is, therefore, no one-to-one relation between an agent interacting with a causal governing social phenomenon and its effect. This means that any social phenomenon is, typically, *'out of phase'* with the actions and events it governs. This explains why, for example, some, but not all, women find themselves in *'male'* segments.

iii) *Emergence*

Labour markets are emergent. Phenomena existing at one *level* emerge from phenomena existing at a different level and have different properties. H₂O emerges from hydrogen and oxygen. Moreover, properties and powers of water are very different from the properties and powers of hydrogen and oxygen. A trade union emerges from a set of social phenomena (when acted upon by agents) and with it the emergent power to defend worker's pay and conditions generate. This power is not found in any one of the union's individual members, nor in any one of the union's mechanisms: it emerges when the union emerges as a whole. Labour markets emerge from a set of social phenomena and with it the emergent power to match workers to jobs. This power is not found in any individual labour market agent, nor, for example, in any one of the labour market's organisations, but emerges as the labour market emerges as a whole. Emergence is not, however, a *'one-off'* phenomenon: it is an on-going process.

¹⁰ Incidentally, simply adding more (and more) quantitative variables in an attempt to include more social phenomena, or more of those that are quantifiable, deals only with the *'tip of the iceberg'*. For further elaboration see Fleetwood & Hesketh (2010: 159-63).

Consider a situation where a large local employer starts to offer 'family-friendly' working practices such as term-time working in order to attract and retain working mothers. Whatever the intentions of the employer, or merits of this policy, one unintended consequence is to produce, reproduce and re-enforce the discourse or ideology among all those (e.g. HRM staff) engaged in the hiring-process, that women's primary orientation is towards domestic commitments. The type of labour market that subsequently *emerges* is one segregated along gender lines: one segment with full-time jobs reserved for men and another segment with part-time jobs reserved for women.

iv) Transformation

Labour markets are *transformational* or *morphogenetic/morphostatic* (Archer 1995, 1998). Agents do not create or produce social phenomena *ab initio*, rather they reproduce (hence *morphostatic*) or transform (hence *morphogenetic*) a pre-existing set of them. Every action performed requires the pre-existence of social phenomena which agents interact with in order to initiate that action. By drawing upon these social phenomena agents reproduce or transform them. For example, speaking requires the rules of grammar and the operation of a company requires laws for establishing ownership rights. The transformational principle, then, centers upon the rules, laws, and other social phenomena that are the *ever-present condition, and the continually reproduced or transformed outcome of human agency*.

Let us put this in the context of labour markets. Labour market agents (such as employees¹¹) are born into a pre-existing world containing social structures of class, and norms and laws governing the legitimate and acceptable exchange of labour services for wages. These phenomena ensure that labouring activity is a quasi-commodity. In order to act in labour markets, employees must interact with the social structures of class, norms and laws, and by so interacting, they reproduce or transform them. As they reproduce or transform them, they simultaneously reproduce or transform themselves as sellers of the quasi-commodity labour power.

(v) Agency and social phenomena

Transformation involves both agency *and* social phenomena. Sometimes agents reflect on the social phenomena that enable and constrain them, and engage in conscious deliberation designed to meet some object. This reflection and deliberation is irreducible to that of a rational individual, making maximizing decisions if, for no other reason than genuine agents have the ability to choose several courses of action, including attempting to change the social phenomena that constrain them. At other times agents act unconsciously and act on the basis of habit. To do so means they have internalized the institutional rules, via a process of habituation. Just as agents draw upon and reproduce or transform structures and mechanisms, in so doing they reproduce or transform *themselves* as agents of a specific kind – e.g. job-seekers or discouraged workers.

Because both agency and social phenomena are always in operation, there are two sources of change. First, agents can, and do, change their minds. This does not mean that humans are entirely capricious or act whimsically. It does mean that their actions are not entirely predictable because they retain the ability to *always have done otherwise*. To deny this is to deny human subjectivity, creativity, imagination, ingenuity and entrepreneurial activity. Wage rates or working conditions that were accepted as legitimate by workers in one period can become unacceptable in another period and *vice versa*, and it is often difficult to attribute causes to this other than to say workers changed their mind – *sui generis*, or because of

¹¹ I could do the same for employers, but would be repeating the point.

information about other possibilities or comparators. Orthodox labour economists know this and refer to it as changes in 'preferences'. But unfortunately, they almost never investigate the source of these preferences and they are, as Hodgson (2003: 60) puts it, 'immaculately conceived'. The second source of change comes from changes in the social phenomena themselves.

To sum-up. In labour markets: (i) the more multiple causes are at work, especially causes involving social phenomena; (ii) the more social phenomena are 'out of phase' with the actions and events they govern; (iii) the more emergence is at work; (iv) the more social phenomena such as class, norms and laws are at work; and (v) the more genuine agency (i.e. conscious deliberation and unconscious habit) is at work, then the more the relations between labour supply and demand, and wage rates, are likely to be characterised by event *irregularity*. Systems characterized by event *irregularity* are, by definition, open systems. In open systems, labour supply and demand curves cannot exist. Whilst this is not conclusive evidence, we would be extremely foolish to ignore it.

Sub-conclusion (3.1): Ontological reflection gives rise to circumstantial evidence that because labour markets are multiply caused, stratified, emergent, transformational, and subject to human agency interacting with a range of social phenomena, then the relations between labour supply and demand, and wage rates, are likely to be characterised by event irregularity and systemic openness.. In open systems, labour supply and demand curves cannot exist.

4.0 A closer look at the nature of the empirical evidence

I start with an extended quotation from the eminent orthodox labour economist Pencavel and a survey article on empirical work on male labour supply appearing in the prestigious *Handbook of Labour Economics* (1986).

[T]he overwhelming proportion of this empirical work has not questioned the validity of the conventional model; the model has been treated as a maintained hypothesis. Empirical research has concentrated on quantifying the magnitude of the presumed relationships. Such quantification is naturally an important ingredient of any science, but in many laboratory sciences refined attempts at calibration represent a stage of the research that usually follows, not precedes, the testing of hypotheses. In male labour supply research, very little formal testing of the standard model has been undertaken. Labour supply research cannot be indicated for 'measurement without theory', but it can be described as 'measurement without testing' (ibid: 5, emphasis added).

So, why has the great volume of empirical work involved so little testing of the standard model? I suspect that one reason can be attributed to the fact that not merely are we reluctant to *reject* a theory until we have a viable substitute close at hand (this is a familiar proposition in the philosophy of science) but we also hesitate even to *test* a theory until an alternative, behavioural hypothesis is available....A more substantive reason for the lack of hypothesis testing in labour supply research is that *many economists view such tests as tantamount to questioning whether a consumer's income-compensated demand curve for a commodity slopes downwards with respect to its price. After all, so the argument would go, the neoclassical theory of labour supply is a straightforward extension of the consumer's allocation problem and surely we believe that demand curves slope downwards?* (ibid: 5-6, emphasis added).

What guidance has the theory of labour supply...provided for empirical work? As far as the conventional static model is concerned, *I know of no attempts with individual data to specify all the refutable implications of the theory (the positivity of the substitution effect, the symmetry condition, the zero homogeneity condition) as a series of research hypotheses that are either corroborated or refuted by the data.* This is surely surprising in view of the extensive literature that has been concerned with testing the predictions from the consumer's allocation problem (ibid: 51-2, emphasis added).

While the implications of the conventional theory of labour supply have rarely been modeled as a series of testable hypotheses, *researchers do not seem to be reluctant to treat the qualitative implications of the theory as a maintained hypothesis....*In many estimates, it seems as if estimates that do not generate positive substitution effects for hours of work or that suggest nonmarket time is an inferior good are *not interpreted as refutations of the theory, but as indicating some error in implementing the theory* (ibid: 52 emphasis added).

The following teases out Pencavel's main points:

- Whilst Pencavel addresses *male labour supply*, exactly the same arguments could be advanced for females, and for labour demand.
- Most empirical research relating to labour supply and demand is based on orthodox theories and models of the labour market, whose predictions have rarely, if ever, been stated as hypotheses and subjected to corroboration or refutation by the empirical data.
- The validity of the underlying theories and models has simply been accepted as a maintained hypothesis - i.e. a mere act of faith. The reason for this is not hard to see: to question the predictions of these theories and models is to question the fundamental principles of orthodox economics itself. As Rees (1971: 3) noted several decades ago: 'young labour economists no longer bother to defend a demand function for labour derived from a production function – they simply write it down'. The same could be said for supply functions.
- Empirical research has concentrated on quantifying the magnitude of the presumed relationships, typically, in the form of *elasticities* of labour supply and demand. Whilst quantification is an important stage in science, in many laboratory sciences refined attempts at calibration usually follow, not precede, the testing of hypotheses. Moreover, empirical research that concentrates simply on quantifying the magnitude of presumed relationships leaves itself open to criticism. It cannot be accused of 'measurement without theory' because there is plenty of theory. But because this theory is never tested, it can be accused of 'measurement without testing'. It is, of course, possible to go a little further than Pencavel and accuse it of 'measurement without *plausible* theory'.
- Empirical research generating magnitudes and signs that contradict the underlying theory are not interpreted as refutations of the theory, but as indicating some error in implementing the theory or, as I will note in a moment, due to 'technical difficulties'.

Whilst Pencavel's focus is on the lack of empirical testing of the *theories* or *models* of labour supply (and demand), it can be extended to the lack of empirical testing of *labour supply and demand curves*. His comment about empirical research concentrating on 'quantifying the magnitude of the presumed relationships' includes research on the elasticity of labour supply and, therefore, on the relationship between labour supply (and demand) and wage rates.

Sub-conclusion (4.1): Just as there is no empirical research specifically designed to corroborate, or refute, the theories of labour supply and demand, there is no empirical research specifically designed to

corroborate, or refute, the existence of labour supply (and demand) curves. Their existence should, therefore, be questioned, not taken as a maintained hypothesis.

Now, although orthodox labour economists do not carry out empirical research designed to corroborate, or refute, the existence of labour supply and demand curves, they do carry out empirical research on labour supply and demand *elasticities*. This can, with some finessing, be interpreted as evidence for the existence of labour supply curves. Indeed, *estimates of labour supply elasticities is all the evidence there is* for the existence of labour supply curves. The following two caveats are, however, in order: (i) this is not strictly 'by the book', vis-à-vis 'scientific' methods; and (ii) I am not advocating this, I am simply reporting it.

The 'finessing' works like this. Research showing elasticities of labour supply to be positive and >0 , means that changes in labour supply are positively related to changes in wage rates. This can be interpreted as corroborating evidence for the existence of labour supply curves. Similar research revealing elasticities of labour demand to be negative and >0 could be taken as corroborating evidence that labour demand curves exist.¹²

Sub-conclusion (4.2): In the absence of empirical research specifically designed to corroborate, or refute, the existence of labour supply and demand curves, estimates of labour supply elasticities is all the evidence there is of the existence of labour supply and demand curves.

5. Labour supply

To the extent that labour supply elasticities constitute evidence for the existence of labour supply curves (and there is no other evidence), the following section evaluates it.

5.1 Wide variations in labour elasticities

Scores of estimates of labour supply elasticities have been carried out over the last few decades, so to make some headway I will use survey articles by Killingsworth & Heckman (1986), Pencavel (1986), Evers *et al* (2008), Jorgenson & Slesnick (2008) and Chetty *et al* (2011). The following are general comments on the sizes and signs of the estimates.

It appears that there exists great variation in study results and an equally large variation in approaches to estimate the elasticity. As a result, there is little agreement among economists on the magnitude of the elasticity that should be used in economic policy analyses...We see that the mean elasticity for men equals 0.07, whereas for women it equals 0.43. Mean elasticities per study for men range between -0.08 and 0.18 . For women, the table shows great variation across different studies: mean elasticities range from 0.03 to 2.79 (Evers *et al* 2008: 26 and 31).

All in all, most of the estimates suggest that female labour supply elasticities are large both in absolute terms and relative to male elasticities. However, *the range of estimates* of the uncompensated wage elasticity of annual hours is dauntingly large...but...it is the variability, rather than the uniformity, of the estimates that is noteworthy (Killingsworth & Heckman, 1986: 185).

¹² Note that the actual magnitude of the elasticity is irrelevant - as long as it is >0 .

Jorgenson & Slesnick (2008) analyse twenty-seven years of repeated cross sections and conclude that ‘the wage elasticities of labour supply are negative but close to zero’ (Jorgenson & Slesnick 2008: 334-5)

Chetty *et al*’s (2011) meta-analysis focuses upon the wide differences in micro and macro labour supply elasticities. Their overall findings are easy to see via their table 1.

Table 1. Micro vs Macro Labour Supply Elasticities

		Intensive Margin	Extensive Margin	Aggregate Hours
Steady State (Hicksean)	micro	0.30	0.26	0.56
	macro	0.38	0.14	0.51
Intertemporal Substitution (Frisch)	micro	0.50	0.28	0.78
	macro	0.50	2.34	2.84

Two lessons can be drawn from these surveys. First, there are not only large variations in estimates of elasticities, they are often negatively signed – indicating backward bending labour supply curves. Second orthodox labour economists can explain backward bending curves in terms of the income effect being greater than the substitution effect. Variations are explained in terms of ‘technical difficulties’.

Elasticities vary depending upon: the particular conception of elasticity under investigation – e.g. Marshallian, Hicksean, Frisch or m-supply, steady state or inter-temporal. (Kuroda & Yamamoto (2008); whether the research is micro-based and using panel data, or macro-based and using aggregate data; whether the extensive or intensive margin is under investigation (Blundell *et al* 2011; Ljungqvist & Sargent 2011; Saez 2002); whether the supply curve under investigation is the labour supply curve facing the firm or the market in general (Manning 2003); the particular way hours of work are measured – e.g. normal weekly hours, hours worked last week, or time-used data (Klevmarken 2005); whether or not models allow for the (realistic) possibility of hours constraints and differences in the way agents change their hours (Martinez-Granado 2005); whether or not models include households borrowing constraints (Domeij & Flodén 2006); whether a unitary or a collective model of households is used (Blundell *et al* 2007, Bloemen, 2009); whether the (public or private) sector is under investigation (Skatun *et al* 2005); the time horizon (Rogerson & Wallenius 2009); whether the effects of human capital is accounted for (Keane (2011); and whether labour demand is included in labour supply models (Peichl & Siegloch 2012).

Whilst these ‘technical difficulties’ (there are other) should not be underestimated, I will not pursue them because my intention is to take the critique in another direction – which I will illustrate via an analogy with a well-established law of physics. *Ohm’s Law* states that *the direct current flowing in a conductor is directly proportional to the potential difference (voltage) between its ends*, and usually written: $V = I \times R$. If wide variations in empirical research showed that when V rises, and I remains constant, sometimes R rises a little, sometimes a lot, sometimes it does not change, sometimes it falls a little, and sometimes it falls a lot, physicists would (rightly) use this evidence to cast doubt on the existence of Ohm’s Law. And yet, when evidence like this turns up in labour economics, instead of using it to cast doubt upon the law of labour supply, orthodox labour economists simply treat it as the result of ‘technical difficulties’. This shows a distinct lack of ‘healthy skepticism’.

The wide variation in the estimates of elasticities, and/or their negative signs *might*, of course, be caused by 'technical difficulties' that prevent us from uncovering the 'true causal effects' as Roed & Zhang (2003: 192) put it. But we cannot rule out the possibility that the wide variation and/or negative signs *might* be caused by the fact that labour supply curves do not exist. We should resist the temptation to find intellectual comfort in the fact that *some* estimated magnitudes and signs are 'right', whilst conveniently forgetting about all those that are 'wrong'. After all, we manage to avoid being fooled by the fact that a stopped clock is 'right' twice per day.

Sub-conclusion (5.1): Labour supply elasticities have extremely wide variations and negative signs. As evidence for the existence of labour supply curves, it is at best inconclusive and at worst casts doubt on their existence.

5.2 Labour supply elasticities of specific groups

Orthodox labour economists carry out empirical research on the labour supply elasticities of different groups of workers – e.g. husbands, wives, husbands and wives by age groups, husbands and wives with varying numbers of children, black wives, white wives, physicians, nurses, taxi-drivers, sea scallop fishermen and so on. Let us have a closer look at some examples.

In a paper illuminatingly titled 'A Shred of Credible Evidence on Long Run Labour Supply', Ashenfelter *et al* (2010: 637) set out to 'provide a straightforward analysis of the labour supply of workers whose hours are flexible in response to an exogenous wage increase'. They conclude that:

the uncompensated labour supply elasticity for taxi drivers is almost certainly negative and small. This will come as no surprise to those who know the extensive literature devoted to the study of male labour supply (Ashenfelter *et al* 2010: 648).

Shields reviews studies undertaken between 1970 and 2003 on the labour supply of registered nurses and finds elasticities for women of 0.5 and men 0.1. They conclude that: 'wage elasticity is unresponsive (or inelastic) and that very large increases in wages would be needed to induce even moderate increases in nurse labour supply', adding that the 'weak role of wage increases in promoting nurse supply is also supported by recent qualitative studies...which found when asked in interviews most nurses said that they were not primarily attracted to wages but rather to intrinsic rewards such as being able to undertake caring work in a professional manner' (Shields 2004: F493).

Showalter & Thurston's (1997) carry out research on physicians.

Using a combined sample of self-employed physicians and physicians who work for HMOs and hospitals, we get an estimated elasticity of 0.33. Splitting the sample into self-employed and employee, the estimated elasticity of the self-employed is also 0.33 and statistically significant, but for the employee physicians it is 0.10 and statistically insignificant. Looking at a small group of sole proprietors for whom we might expect to find a higher labour supply elasticity, we get an elasticity estimate of 0.61 (Showalter & Thurston 1997: 91).

Kimmel, & Knieser (1998) carry out research on single and married men and women.

The employment elasticity is +0.6 for single men versus +1.1 for married men; the employment elasticity is +2.4 for single women versus +1.8 for married women. The compensated hours worked elasticity is +0.4 for employed single and married men and +0.7

for employed single and married women. The implied aggregate employment elasticity of +1.5 and hours per employee elasticity of +0.5 indicate employment fluctuations account for three fourths of wage-induced variation in labour hours (Kimmel, & Knieser 1998: 289).

I could cite more examples of research of this or that group or labour market participants, but prefer to draw the point to a conclusion by Kaufman & Hotchkiss who are probably correct in their general observation that:

For adult men, nearly all studies find the labour supply curve to be negatively sloped or backward bending (Kaufman & Hotchkiss 2006: 9).

What, then, does empirical research estimating labour supply elasticities of specific groups tell us about the existence of the labour supply curve? Remember that empirical research revealing that the elasticity of labour supply is positive and > 0 can be interpreted as corroborating evidence. It tells us two things.

First, consider the case for men - I come back to female labour elasticities below. Most empirical research on male labour elasticities reveals them to be negatively signed, zero or very low in magnitude. What exactly does this tell us?

- Negatively signed elasticities mean that men supply *less* labour services in response to increases in wage rates - evidence against the existence of labour supply curves.
- Zero magnitudes mean that men do not change the quantity of labour services they supply in response to changes in wage rates - evidence against existence of labour supply curves.
- Small magnitudes mean that men hardly change the quantity of labour services they supply in response to changes in wage rates. Given the 'technical difficulties' noted above, the absence of large magnitudes, or conversely, the large number of magnitudes close to zero, mean the evidence is at best inconclusive, and at worst, casts doubt on the existence of labour supply curves.

One orthodox labour economist, who recognises this might be a problem, is Pencavel, who writes:

the elasticities of hours of work with respect to wages is very small. In other words, the focus of most economists research has been on behavioural responses that for most men appear to be of a relatively small order of magnitude. In the case of applications of the static model of labour supply, there are a number of instances in which the income-compensated wage elasticity of hours of work are estimated to be negative. This, of course, violates an important (some would judge it to be 'the' important) implication of that model, and consequently it casts doubt on the empirical relevance of the model (Pencavel 1986: 84).

Pencavel massively understates the problem associated with negatively signed, small, and zero male elasticities of labour supply. These elasticities violate the very foundation stones of orthodox models of labour markets, and cast doubt on the existence of labour supply (and demand) curves.

Sub-conclusion (5.2a): Most elasticities of labour supply for men are negatively signed, small, and zero, implying that there is no law-like relationship between changes in the quantities of labouring services supplied and changes in wage rates. As evidence for the existence of labour supply curves, it is at best inconclusive and at worst casts doubt on their existence.

Second, research indicates that labour supply curves can be 'vertical', 'forward falling', 'backward bending', or 'inverted S-shaped' - and who knows what 'shapes' will turn up in the future. It is hard for the healthy skeptic *not* to draw the conclusion that, *if labour supply curves can have so many 'shapes', maybe they have no fundamental shape at all: maybe they do not exist.*

Sub-conclusion (5.2b): Empirical research on supply elasticities indicates that some labour supply curves are forward falling, some are backward bending and some are inverted S-shaped. As evidence for the existence of labour supply curves, it is at best inconclusive and at worst casts doubt on their existence.

5.3 Explanations of variations and anomalies

The response from orthodox labour economists is likely to be two-fold: (i) 'all this is well known'; and (ii) 'we can explain it anyway'. Wide variations in elasticities, and anomalies like zero, low and negative elasticities, and vertical, backward bending and s-shaped labour supply curves, they would argue, simply reflect the differences in preferences and/or 'institutions' found in different segments of labour markets and do not necessarily undermine the existence of labour supply (and demand) curves. Roed & Zhang (2003: 192) observe that 'variation in elasticity estimates...is exactly what should be expected on the basis of economic theory'. Unfortunately, this response scores a spectacular own-goal. To *explain* the empirical claim that 'labour supply curves do not exist', by invoking preferences and/or 'institutions', is to explain *why labour supply curves do not exist*. It plays straight into the hands of the skeptic.

Explanations of wide variations in elasticities and anomalies invoking differences in preferences, without explaining preferences (i.e. taking them as 'immaculately conceived'), does not explain variations and anomalies: *it explains them away*. Explanations of wide variations in elasticities and anomalies invoking differences in 'institutions', imply that '*institutions must be exerting significant causal influence on the relationships between labour supply and wage rates* - indeed, this is the point of the exercise. Paradoxically, the problem worsens the more accurate the estimates of labour supply elasticities are. If they are very accurate, then the wide variations in elasticities, low, zero and negative elasticities, backward bending and s-shaped curves cannot be idiosyncratic or accidental, but must be systematic, and systematically caused by 'institutions'. The problem eases the less accurate these estimates are. But the less accurate they are, the less they constitute evidence for the existence of labour supply curves.

Incidentally, Roed & Zhang's observation that 'variation in elasticity estimates', not to mention, anomalies are 'expected on the basis of economic theory', wins a battle and loses a war. It uses one theory to explain anomalous empirical evidence, whilst ignoring the fact that this empirical evidence undermines one of the foundation stones upon which all orthodox labour economic models are built - i.e. labour supply curves.

Sub-conclusion (5.3): Wide variations in labour supply elasticities, low, zero and negative elasticities, and backward bending, and s-shaped labour supply curves exist. They can be explained by preferences, 'institutions' (or other complexities) found in different segments of labour markets. If so, then preferences and 'institutions' must be exerting significant influence on the relation between labour supply and wage rates, characterising this relation as one of event irregularity and casting doubt on the existence of labour supply curves.

5.4 Retreat to median elasticities

Troublesome variations in labour supply elasticities disappear by shifting the focus to *median* values - commonly accepted to be around zero for men and around 0.4 for women. But then a different problem

emerges. All (defensible) *empirical* claims should continue to make sense when placed in a realistic context. By design, however, median values omit specifics and, thereby, *de-contextualize*. An obvious dilemma now looms.

Elasticity measures the responsiveness of a change in labour supply to a change in wage rates. When dealing with de-contextualised measures, especially *median* values, it is easy to focus attention on the responsiveness of the magnitude itself (i.e. the mere change in quantity) and overlook the far more important matter: the responsiveness of labour market agents' *actions*. Any change in the quantity of labour supplied is due to a change in agents' courses of action. And this is always in context. What happens, then, if we locate the empirical claim 'the median *female* labour supply elasticity is 0.4' in a realistic context of women's domestic and work environments? Does the empirical claim continue to make sense when contextualised, or better put, is the empirical claim consistent with reality? If so, and to the extent that a median labour supply elasticity of 0.4 constitutes some kind of evidence for the existence of labour supply curves, the empirical evidence is strengthened by the exercise. If not, the empirical evidence is weakened.

In the following exercise, I will create a *hypothetical* and *abstract*, but nevertheless *realistic* example, giving (no more than) a little context to women's domestic and work environments. I will then contextualise and exemplify the median elasticity of 0.4 by assuming that a 5% increase in wage rate, from €10.00 to €10.50 per hour, causes a 2% increase in female labour supply. Finally, I will ask whether the courses of action implied by the increase in female labour supply are *consistent* with reality – i.e. consistent with the courses of action that real women would have to take in real domestic and work environments.

In most societies, women are mainly responsible for performing unpaid domestic labour - *inter alia* running the household, caring for children and increasingly (because of neo-liberal policies) caring for elderly relatives. The full range of activities involved are wide, varied, and typically involve *enormously complex* juggling and negotiating with friends, neighbours, partners, wider family members and organisations like social security services, nurseries, medical centers, dentists, schools and employers. The responsibility for performing domestic labour is not genetically programmed, but socially constructed, via social structural constraints and institutionally ingrained habits of men and women.

Imagine a small business employing 100 women, all with children and full-time working partners. An increase in the wage rate from €10.00 to €10.50 per hour implies:

- a) At the *extensive* margin 2 extra women would enter the labour market.
- b) At the *intensive* margin already working women would increase their hours from 40 to 40.4 hours, or by 24 minutes.

Consider (a). Are the courses of action that would be necessary for two previously unemployed women to enter the labour market consistent with the typical courses of action real women would have to take given real domestic environments? We only have to ask the question to realize that the answer is 'no'. In all likelihood, if these two women wanted to work, and were in a position to sort out their complex domestic activities, they would have done so already and be working for €10.00 per hour. These women are unemployed, at least in part, precisely because they cannot side-step their domestic activities, and a 5% increase in the wage rate, which is actually quite substantial, is irrelevant when placed in context.

Consider (b). Are the courses of action that would be necessary for already working women to increase their working hours by 24 minutes consistent with the typical courses of action real women would have to take given a real domestic and working environment? Once again, the answer is 'no'. First, a pay rise of

this magnitude would be unlikely to cause the complete re-structuring of complex domestic activities and arrangements necessary to accommodate this small increase in her working week. Second, it is unlikely that this extra 24 minutes could be introduced within the 'institutionalized' context of a real workplace.

In sum, this exercise illustrates a crucial point. It shows that the empirical claim (i.e. 'the median female labour supply elasticity is 0.4') is inconsistent with the reality of women's domestic and work environments.

Before leaving this exercise, allow me to deal with a potential objection, namely, that little can be concluded from such a hypothetical, abstract example. I could, of course, easily make the example far more concrete via the addition of other realistic and important 'institutional' factors or other qualitative social phenomena. This would, however, almost certainly *increase* the degree of inconsistency and the objection would back-fire.

Sub-conclusion (5.4): To the extent that a median female labour supply elasticity of 0.4 constitutes evidence for the existence of labour supply curves, this evidence is at best inconclusive because it is inconsistent with the reality of women's domestic and work environments.

6. Labour demand

To the extent that labour demand elasticities constitute evidence for the existence of labour demand curves (and there is no other evidence), the following section evaluates it.

6.1 Wide variations in elasticities

Dozens of studies of labour demand elasticities have been carried out over the last few decades and summarizing them is by no means an easy task. I will draw upon an article by Rowthorn (1999) who reports the findings from three separate studies of the elasticity of demand in nineteen OECD countries. To get some idea of the variations, consider a couple of examples.

The size of the elasticities reported across the three studies *for the same country* shows wide variations. For example, the magnitude of the elasticity reported for Canada is 0.5, 2.11 and 5.0; for Germany it is 0.83, 1.71 and 2.17; and for Switzerland it is 0.63, 1.68 and 3.41. The magnitude of the elasticities for *different* countries also shows wide variation. For example the smallest magnitude was reported for Finland at -0.71, whilst the largest was reported for Canada at 5.00. Rowthorn concludes that most estimates of the elasticity of labour demand, from these and other studies, are positive, significant and somewhere between 0.6 and 0.76. Similar conclusions emerge from these wide differences within, and between, countries that emerged in the case of estimates of labour supply elasticities above.

The same reasoning used above to interpret differences in labour *supply* elasticities can be applied to the wide differences in labour *demand* elasticities, so I will move directly to the sub-conclusion.

Sub-conclusion (6.1): Labour demand elasticities have extremely wide variations. As evidence for the existence of labour demand curves, it is at best inconclusive and at worst casts doubt on their existence.

6.2 Explanations of variations

As with labour supply, the orthodox response to wide variations in demand elasticities is likely to be that they reflect differences in preferences and/or 'institutions' found in different segments of labour markets. Again this type of response scores a spectacular own-goal. To explain an empirical claim like 'labour

demand curves do not exist' by invoking preferences and/or 'institutions', is to explain *why labour demand curves do not exist*. Because the same reasoning applies, I will move directly to the sub-conclusion.

Sub-conclusion (6.2): If wide variations in labour demand elasticities can be explained by preferences or 'institutions', then these phenomena must be exerting significant influence on the relationships between labour demand and wage rates. If so, then preferences and 'institutions' must be exerting significant influence on the relation between labour demand and wage rates, characterising this relation as one of event irregularity and casting doubt on the existence of labour demand curves.

6.3 Retreat to median elasticities

Troublesome variations in labour demand elasticities disappear by shifting the focus to *median* values - commonly accepted to be between 0.6 and 0.76. But then a different problem emerges. Actually, it is the same problem elaborated upon in section 3.4, so we can move directly to imagining a *hypothetical and abstract*, but nevertheless *realistic* example, giving (no more than) a little context to the environment of the firm. Let us contextualise and exemplify the median elasticity of 0.6 by assuming that a 5% increase in the wage rate (from € 10.00 to € 10.50 per person, per week) causes a 3% decrease in the demand for laboring services, that is, a reduction in the workforce from 103 to 100.

How likely is it that, when faced with this increase in wage rate, this firm would reduce its workforce by 3 employees *and do absolutely nothing else*? We only have to ask the question to realize that the answer is 'very unlikely'. The response is far more likely to be to cajole or coerce its employees into working unpaid over-time, intensify work by 'sweating' the workforce, clamp down on time taken for coffee and lunch breaks, change management practices, introduce incentive based payment systems, change shift patterns, introduce flexible working arrangements, reduce training, shelve future plans for recruitment, to name some of the most common, and highly likely, courses of action. Moreover, a reduction in 3 employees ignores technological and socio-political problems associated with changing labour without changing capital. In short, shedding labour is one of the last actions a real firm would do in response to an increase in wage rates of this magnitude.

In sum, this exercise illustrates a crucial point. It shows that the empirical claim ('median labour demand elasticity is 0.6') is inconsistent with reality, i.e. inconsistent with the courses of action real workers would have to take in firms.

Once again, note that I could make this hypothetical, abstract example far more concrete via the addition of other realistic 'institutional' factors. This would, however, almost certainly *increase* the degree of inconsistency.

Sub-conclusion (6.3): To the extent that a median labour demand elasticity of 0.6 constitutes evidence for the existence of labour demand curves, this evidence is at best inconclusive because it is inconsistent with the reality of the environment of the firms.

6.4 Estimates of labour demand elasticities as 'statistical artifacts'

One of the reasons to doubt the empirical evidence of labour demand elasticities is because of the possibility that they are 'mere statistical artifacts' as Felipe & McCombie (2009) call them. This is, however, far from straightforward and entails a foray into the 'capital controversy' to show that estimating demand elasticities is tantamount to estimating identities and, therefore, should always result in negative, significant elasticities.

The demand for labour function is derived from the marginal revenue product of labour (MRPL). The production function maps the magnitude of produced output onto magnitudes of inputs, typically, labour and capital. Variations in the magnitude of labour and capital that are brought into, or removed from, the production process, cause changes in the magnitude of the output. The relationship between the value of outputs and the value of inputs is what Felipe & McCombie (2009: 148 *passim*) refer to as a 'behavioural relation'. The implication of this will become important in a few moments.

Most text-books introduce readers to 'engineering' or 'physical' production functions (although most text-books never make this entirely clear) because it is the easiest case to explain. In this case, output is assumed to be an identifiable and measurable quantity of some homogeneous, typically physical, thing. Input, referred to as 'capital', is also assumed to be an identifiable and measurable quantity of some homogeneous, typically physical, thing such as machine tools. In a neat play on the idea of physical inputs being expressed as 'steel', Joan Robinson coined the term 'leets' to refer to some fictitious, identifiable, measurable and homogeneous capital input. I will make use of it below. Labour is presumed to have its own unit – which is not actually straightforward, but I will not pursue it here.

Some text-books make reference to problems arising in cases where inputs and outputs are not easily identified – e.g. education where the input of a teacher and the output (learning) is difficult to identify and measure. But what is never mentioned, is a fundamental problem with the identification and measurement of capital – i.e. what exactly are 'leets' and how are they measured? Capital is usually simply denoted 'K' (with labour denoted 'L') and inserted in an equation or placed on the axis of an isoquant map. Most lecturers introduce students to the idea of K (and L) and then, as Robinson once noted, move swiftly on before a bright student thinks to ask what unit 'K' is measured in. The problem, as simple as it is important, is that we cannot add a hammer to a screwdriver, a metal press, a machine tool, a checkout till, a computer or any other piece of machinery. We can often identify these different kinds of things, but we cannot measure them, and because of this, we cannot attribute a portion of the output they contribute to them. In this case there cannot be any such thing as an additive or *aggregate* 'engineering' production function. Each individual capital input would have to have its own production function. This is not difficult to *imagine* – although there is a question mark about the realisticness of such an entirely imaginative exercise. We can imagine a production function expressing how output changes when another screwdriver is added to an existing bundle of screwdrivers and workers. We can imagine another production function expressing how output changes when another checkout till is added to an existing bundle of tills and workers. But we could not add these two production functions together because checkout tills and screwdrivers are heterogeneous.

The way out of the problem is, of course, to identify and measure capital, along with labour and output, in *value or money price* terms. In this way, an aggregate ('engineering') production function is expressed not in physical, but in value units. Whilst this overcomes one problem, it runs into another one. Let us explore this in some depth.

Start with a basic 'engineering' production function – I leave technology out to keep matters simple: the argument is unaffected by it.

$$Q = f(L, K) \quad (1)$$

Q denotes a physical output, let's call them 'widgets'.

L denotes physical units of labour, perhaps worker hours, or numbers of workers.

K denotes physical units of capital, let's call them 'leets'.

The demand for labour function is not only derived from this 'engineering' production function, it rests upon all the stories, commentaries, observations, economic principles, mechanisms, processes, causal laws and other kinds of event regularities, technical devices, mathematical devices, axioms, assumptions, presumptions and *ceteris paribus* conditions that constitute the orthodox theory of production. To estimate the demand for labour function is to estimate a segment of this 'engineering' production function, although the latter has to undergo the transposition from physical to value terms first.

Text-books usually fudge this issue. Perhaps because the focus of chapters devoted to discussing labour demand is on labour, not capital, that the discussion of capital 'slips behind the radiator pipes' as it were. Perhaps it is also due to the fact that in the initial stages of the analysis, capital is assumed to remain constant and only the labour input into production is assumed to change its magnitude. But this is a serious omission because labour and capital (assuming these are the only two inputs into production, which is usual) are two sides of the same coin. As soon as we drop the assumption of capital remaining constant, then any change in the magnitude of the labour input effects the magnitude of the capital input – and *vice versa*.

The transposition from physical to value terms vis-à-vis labour is not entirely straightforward, but as noted, I will not pursue this here. The return to labour, a wage, has a value unit in terms of some currency. The *value* of the labour input is expressed by multiplying the wage rate (w) by the amount of workers (L) involved in production – i.e. wL . We can (at least sometimes) also express the *marginal* physical output, or *marginal* physical product (MPP) of labour in value terms by multiplying the MPP by the price of the widget, that is the price of each product attributable to an increase in the additional, marginal labour input. This gives the Value Marginal Product (VMP) function. In this case, Q is also transposed from physical terms (widgets) to value terms. At this point, many text-books make use of various diagrams showing labour on one axis and the wage rate in some currency on the other axis.

But whenever capital appears on the axis of any of these diagrams, especially isocost curves (i.e. curves or functions showing the various combinations of K and L that can be purchased with a specific dollar outlay, given the prices of the two inputs) it is either expressed in physical terms, units of K , 'leets' or some such; or a sleight of hand is used. McConnell, Brue & Macpherson (2006: 164) for example, note that 'the price of K and L are \$6 and \$4 per unit respectively'. 20 units of capital, then, can be expressed as \$120. In the rest of the book, McConnell, Brue & Macpherson do what many other writers of text-books do, and make use of isocost functions. Expressing capital as K , 'leets', or as \$4 per unit is legitimate only under one condition: that by the term 'capital' we have in mind a single class of thing, such as screwdrivers. The production function underlying these theoretical developments, be it in its 'engineering' or value guise, is a *disaggregated* production function: it is a production function for one single capital input. The VMP curve, and hence the demand for labour curve derived from this production function, are built on the curious idea that the changes in labour demand are caused by changes in the relative prices of labour *and* screwdrivers. In order to even think about changes in the demand for labour for the whole firm, that is, to have an aggregate demand curve for the firm, we would in effect, have to have separate production functions and VMP curves for *every single capital input in the firm*. This is almost never made clear in orthodox labour economics text-books, and students are led to believe that what they are actually considering is an aggregate production function, so that the demand curve derived from it expresses changes in the magnitude of labour demanded relative to capital at the level of the whole firm. The important point to note here is that the cost, or the price, of capital has been smuggled in. The fact is,

there is no identifiable, measurable and homogeneous entity called capital. Even if we knew that the price of a unit of capital was \$4 we simply have no idea how much of this 'stuff' we have.

When it comes to empirical analysis, and empirical estimates of the demand for labour, a disaggregated production function, in its 'engineering' or value guise, is useless. An aggregate production function is needed, and for that, capital, labour and output have to be expressed as identifiable, measurable and homogeneous entities. The usual approach is to transform the production function from physical units to value units - euros, pounds, dollars etc.

First, the output measure Q is replaced with V, value added in prices – whether we are dealing with real or nominal prices does not affect the argument, so I will just leave it out of the picture.

$$V = f(L, K) \quad (2)$$

Next L and K are transposed from physical to value units by multiplying labour by the wage rate and multiplying capital by the profit rate. This gives us the following *identity*:

$$V \equiv wL + rK \quad (3)$$

V denotes value added in prices

W denotes wage rate

L denotes physical units of labour

K denotes the value of the stock of capital – measured in current or constant prices

r denotes the profit rate.

Notice, however, that something unusual has happened between equation 2 and equation 3. Unlike equation 2, equation 3 has become an *identity*. It is an identity because, effectively, it states that the total value added is divided between wages and profits. This is important because the *causality* implied in the production function (2) has now disappeared. Equation 3 does not say (or imply) that the magnitudes of $wL + rK$ cause the magnitude of V to be what it is; instead it merely says $wL + rK$ is identical to, or is an equivalent of, V. According to Felipe & McCombie (2009: 155), most equations used to estimate the elasticity of labour demand are versions of this identity and they cite the following four as the most common.

$$\ln L = -\ln A_0 + (1 - \alpha) \ln[\alpha / (1 - \alpha)] + \ln V - (1 - \alpha) \ln w + (1 - \alpha) \ln r - \lambda t$$

$$\ln L = \ln \alpha + \ln V - \ln w$$

$$\ln L = -(1 - \sigma) \ln A_0 + \sigma \ln \delta + \ln V - \sigma \ln w - (1 - \sigma) - \lambda t$$

$$\ln L = (1/(1 - \alpha)) \ln A_0 + (1/(1 - \alpha)) \ln \alpha + \ln V - (1/(1 - \alpha)) \ln w + (1/(1 - \alpha)) \lambda t$$

This is not a mere technical oddity. Estimating an identity means that any implied causality disappears: we are no longer dealing with a 'behavioural relation'. Regression resulting from an identity, and showing an association between the variables in the various demand functions, no longer has any policy implications. The fact that many estimates of the elasticity of labour are significant, and in the region of 0.6 to 0.76 is to be expected because they are merely estimates of an identity.

Because the underlying of an accounting identity, it is possible to obtain a negative value of the elasticity of labour demand with respect to the wage rate, even though there may be no behavioural relationship involved. Indeed, it is very difficult to obtain anything other than a statistically significant negative 'elasticity'. All that is being estimated is an approximation of an identity which is, of course, true by definition (Felipe & McCombie 2009: 148).¹³

Sub-conclusion (6.4): If the median elasticity of labour demand is a mere statistical artifact, then it constitutes no evidence for the existence of labour demand curves.

Conclusion

Circumstantial and empirical evidence for the existence of labour supply and demand curves is at best inconclusive, and at worst casts doubt on their existence. Whilst we cannot rule-out the possibility that evidence will be found in the future, the following conclusion seems (currently) warranted: *labour supply and demand curves do not exist*. Orthodox labour economists must either provide evidence for the existence of labour supply and demand curves or stop building models of labour markets on the foundation stones of supply and demand curves. The second point triggers an important question: Are there alternative foundations?

The most obvious place for *orthodox* labour economists to look for alternative foundations is in the currently fashionable search and matching theories and models. Pissarides's matching model, for example, 'replaces the conventional demand and supply diagram for labour with a new diagram' (Pissarides 2000: 19). The *job creation curve* replaces the demand curve, and the *wage curve* replaces the supply curve. To the best of my knowledge, however, no-one is arguing that supply and demand models, and with them all traces of supply and demand curves, should be replaced with search and matching models. Text-books still follow the traditional format: introduce labour supply, introduce labour demand (or *vice versa*) and only introduce searching and matching in later chapters (e.g. Laing 2011). It is difficult to say why search and matching models have not replaced supply and demand models, but the following seems likely: (a) because many of the theoretical components of searching and matching models are derived from labour supply and demand curves; (b) because this would break the symmetry where labour markets are understood to be similar to all other markets – albeit with some special characteristics; (c) because it would leave economic theory without a consistent theory of value and distribution; (d) because what is referred to as 'matching technology' is no more than a 'black box'; and (e) because matching models are themselves without empirically supported foundation stones. As two leading advocates of matching models put it:

[T]he matching function is a black box: we have good intuition about its existence and properties, but only some tentative ideas about its microfoundations. Yet those tentative ideas have not been rigorously tested (Petrongelo & Pissarides 2001: 424).

What about the place of labour supply and demand curves in *heterodox* labour economics or, more broadly, *socio-economics of labour markets*?¹⁴ Some socio-economists believe that labour supply and demand curves exist, but are always influenced by 'institutions' and should be modeled as such. This is,

¹³ The critique deployed by Felipe & McCombie holds for any state of competition, any degree of returns to scale, any assumptions about factor shares being constant, and for the two common measures of the return on capital.

¹⁴ See Fleetwood (2006: 59 and 2010:1) for elaboration of who constitutes this approach.

however, problematic. If the influence is only slight, then socio-economists' claims become indistinguishable from orthodox economists' claims – as the following example shows:

Especially in the long run, institutional decisions are more likely to supplement the labour market than compete with it. They do so, first, by giving a precise answer to questions on which the market only gives general guidance....Second, market and institutional pressure often work in the same direction. Management decisions or union contract terms set a seal of approval on changes that were on the cards on economic grounds...We should not deny that institutional pressures make a difference, but the difference is usually less than it seems, and to estimate its size requires careful analysis (Reynolds *et al* 1998: 7).

But what happens when this influence is significant and, moreover, when market and institutional pressure work in different directions? This is even more problematic. The problem can be illustrated via the *Transitional Labour Market* (TLM) approach. In a recent survey of the TLM approach, Gazier & Gautier make the following important observations.

The TLM approach underlines that in the labour market, the three basic classes of variables interact with notable and perhaps increasing difficulties. Prices, quantities and qualities remain active and relevant, but their role, through the variation in wages, hours, staffing, competences and training, appears to be more and more constrained (Gazier & Gautier 2012: 7-8).

TLMs advocate the creation or development of 'markets'. As such, they introduce what are originally non-market forms of coordination and intervention...into existing markets, but without attacking the prevailing market logic...[T]heir final, maybe unintended, effect is simply to improve, or make tolerable, the functioning of the market system, nothing more (Gazier & Gautier 2012: 16).

Many advocates of the TLM approach want to keep 'institutions' and labour supply and demand curves in their models, even when they know the latter exert significant influence. The problem can be illuminated via the following *rhetorical* questions:

- Does the presence of 'institutions' entirely *negate* labour supply and demand curves? If so, does this mean labour supply and demand have *no* effect on wage rates? If so, are wage rates determined *entirely* by 'institutions'?
- Does the presence of 'institutions' merely *modify* the relationship between labour supply and demand such that, as Fevre (1992: 25) puts it: wages, are 'determined (or at least heavily influenced by) the laws of supply and demand'. If wage rates are 'heavily influenced' by labour supply and demand, how 'heavy' can this influence be before it is overtaken by the influence of 'institutions'?
- Is it the case, that labour supply and demand set boundaries to wage rates, and 'institutions' regulate actual wage rates? Or is it the case, that the 'institutions' set boundaries to wage rates, and the forces of labour supply and demand regulate actual wage rates?

There is, of course, no answer to these rhetorical questions. But as I have been at pains to point out, if 'institutions' exert significant influence on the relationships between labour supply and demand, and wage rates, then these relationships are likely to be characterised by event *irregularity*. Systems characterised by event *irregularity* are open systems, and in these systems, labour supply and demand curves cannot exist. Many advocates of the TLM approach pull-back from this conclusion, despite the fact that this is where

their argument leads. That said, there is no reason why many of the insights from the TLM approach cannot be retained, and a TLM model *without labour supply and demand curves* be built. Indeed something like this would be compatible with my own embryonic model (Fleetwood 2011b).

There are, however, socio-economists who almost certainly doubt the existence of labour supply and demand curves - e.g. Brown (2005), Ramstad (1993), Rubery & Wilkinson (1994), Rubery (1997), Rubery & Grimshaw (1998), Spencer (2001, 2006, 2009), Storper & Walker (1983) and Tilley & Tilley (1998). This doubt is consistent with the *Productive Systems* approach, typified by Burchell *et al* (2003) and Beynon *et al* (2002) and the *Societal Analysis* approach of Maurice & Sorge (2000). I am not, however, aware of any socio-economist prepared to state, unequivocally, that labour supply and demand curves do not exist – although the following comes fairly close:

The traditional working of supply and demand in the labour market have all but disappeared in the high productivity, planned core of the U.S. Economy. They have been replaced (*if they ever existed*) by two related processes¹⁵ (Dugger 1981: 398, emphasis added).

Whatever alternative models of labour markets socio-economists come up with in future, one thing is clear: they should not feature supply and demand curves. This will not trouble those who have already left supply and demand curves behind. But what about those socio-economists who, whilst being ‘healthy skeptics’, are nevertheless reluctant to abandon labour supply and demand curves? My hope is that the arguments made above will give them the confidence to leave supply and demand curves behind and press on to develop real alternatives to orthodox models.

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¹⁵ For Dugger, processes of filtering replace those of price adjustment. The first process he mentions sorts people into occupational slots, whilst the second guides the ascent of the sorteés up the occupational hierarchies.

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