Economic Thought 4.1: 67-79, 2015

Adam Smith's Use of the 'Gravitation' Metaphor

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Abstract

Adam Smith, in *Wealth of Nations*, used gravitation as a rhetorical metaphor and not in a formal philosophical sense, as used by Newton, Aristotle or Empedocles. Physical gravitational attraction is predictable, accurate and rule-bound; metaphoric gravity, as in relationships between natural and market prices, are neither strictly rule-based nor predictable. Market exchange relationships between independent people are subject to the vagaries of imperfect rhetorical persuasion.

Keywords: invisible-hand, metaphors, rhetoric, gravitation, natural prices, market prices

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1. Introduction

David Andrews presents an interesting philosophical view that Adam Smith's use of the gravitation metaphor expresses the embodied ideas of Aristotle and Empedocles, rather than those of Newton (Andrews, 2014) and supports this view by analysing how Smith used 'gravity' in the context of his discussion of 'natural' and 'market' prices. This paper offers a view that Smith used metaphoric figures of speech that are consistent with his teachings on rhetoric (1748-64), as evidenced in his *Lectures on Rhetoric and Belles Lettres* (LRBL, 1762-3), and as he demonstrated by frequent use of metaphors in his published works. I am not here engaging with the established discussion of Smith's debt to Newton (Smith, 1795; Schliesser, 2005; Montes, 2008), rather I focus on the particular claim by David Andrews that Smith's use of gravity in the context of the discussion of natural and market prices is non-Newtonian.

Smith, in my view, did not offer a deeper philosophical meaning to the gravitation metaphor, whether based on Aristotle, Empedocles or Newton. Such interpretations are not relevant to Smith's purely pedagogic purposes. His rhetorical use of gravitation as a metaphor is also consistent with his long explanations of the dynamic relationships between natural and market prices in *An Inquiry into the Nature and Causes of the Wealth of Nations* (WN) (I.vii-xi.p, pp.72-267; Howell, 1975; Wightman, 1975).

First, I shall briefly examine Adam Smith's teaching on language and grammar, secondly, comment on where he considered that rhetoric contributes in its general and specific roles, thirdly, look at his use of metaphors as figures of speech, fourthly comment on and apply Smith's arguments on his metaphoric use of gravitation to the relationships of natural and market prices (WN I.ii.vii-xip). I shall not comment on modern treatments of rhetoric or metaphors because the focus of this debate is on what Adam Smith understood about rhetoric and metaphoric speech when he taught and wrote his Works, for which purposes it is my view that 20th-century theory is not relevant (Alonso-Cortes, 2006; Bazerman, 1993; Dascal, 2006; McKenna, 2006; Wightman, 1975).

2. Smith on Language and Rhetoric

Smith's interest in the origins of language in human societies led him to publish a version of his '*Considerations Concerning the First Formation of Languages and the Different Genius of original and compounded Languages*', in the short-lived *Philological Miscellany* (1761). He also included his ideas on the evolution of language and grammar in his lectures on rhetoric (LRBL, v. 53-61, pp. 23-25). When he travelled in France in 1764-6 with the young Duke of Buccleuch, he probably found that his ideas on the origins and evolution of language were not as widely known among scholars there as he might have expected – given that these matters were already of wide interest among 18th-century French scholars (Rameau, 1722; Condillac, 1746; Diderot et D'Alembert, 1751-77; Rousseau, 1755; Smith, 1761, 1767; cf. Otteson, 2002).

On his return to London he instructed his printer to add his '*Considerations*' paper to the 3rd edition of *The Theory of Moral Sentiments* (TMS, 1767) which he was preparing (Smith, Corr. Letter No. 100, to William Strahan). His 'Considerations' paper was also included in subsequent re-printings of TMS throughout the 19th century. In the event, not much attention was paid to his thoughts on rhetoric, though once 'Considerations' circulated more widely in print, he had at least advertised any claims he believed he merited for his scholarship on rhetoric. Following discovery of 'Dr Smith's Rhetorick Lectures' among papers in Tolquhoun Castle (Aberdeen) in 1958, and published in 1963 (Lothian, 1963; Smith, LRBL, 1983), some modern economists took a closer interest and made significant contributions (Skinner, 1966; 1972; Berry, 1975),.

Adam Smith's comprehensive thoughts on English rhetoric derived from his nine years attending Moral Philosophy and Rhetoric courses and private readings (Glasgow, 1737-40 and Oxford, 1740-46), followed by 15 years of teaching rhetoric – first in Edinburgh in his public lectures, sponsored by Lord Kames, (1748-51), and secondly, at Glasgow University in his professorial lectures on rhetoric (Howell, 1975, pp.10-43). A near-verbatim set of student notes reporting on Smith's rhetoric lectures in his Glasgow University private class of November–February 1762-3 was published in the 'Glasgow Edition of The Works and Correspondence of Adam Smith' (Smith, LRBL, 1983). Smith wrote:

> 'After language had made some progress it was natural to imagine that men would form some rules according to which they should regulate their language. These rules are what we call grammar' (LRBL, p. 25).

Smith's laid great stress on 'perspicuity' favouring a 'plain style' which set out clearly the proper composition of an author's meaning that could be understood clearly:

> 'When the sentiment of the speaker is expressed in a neat, clear, plain and clever manner, and the passion or affection he is possessed of and intends, by sympathy, to communicate to his hearer, is plainly and cleverly hit off, then and then only the expression has all the force and beauty that language can give it' (LRBL, pp. 25-6).

In contrast, Smith regarded classical styles of rhetoric unfavourably – especially in their teachings on 'figures of speech' and their lack of substance in flowery language. He demonstrated what he regarded as the modern role of figures of speech in the English language throughout his Works and Correspondence. His teaching on metaphors conforms to the reforms to rhetoric theory then underway in the 18th century (Howell, 1975). He was firmly of the opinion that English rhetoric was a 'communicative' device supported by a 'plainness of style', as shown by Jonathan Swift, in contrast to what Smith described as the 'outworn stylisitic conventions of such as Lord Shaftesbury' who, because of his lack of 'depth of reasoning' was glad to 'set off by the ornament of language what was deficient in matter' in his 'pompous, grand, and ornate style' (Howell, 1975, pp. 23-25, quoting Smith, LRBL, i.143-148. pp. 58-61). Smith focussed his ire on Lord Shaftsbury for obscuring his relative ignorance by misusing allegorical and metaphorical 'flowers of speech' that led to 'a dungeon of metaphorical obscurity' to the detriment of perspicuity (LRBL, i.13: p. 8). Practitioners who were taught classical rhetoric were bound by the five-part division for a classical oration that rigidly incorporated the sequence of: 'beginning, narrative, confirmation, refutation, and peroration' at the expense of perspicuity. This style of oratory was common in courts of law where it was practised by eloquent prosecutors and defenders at the risk of avoidable injustice.

Smith identified two styles of discourse in rhetoric, specifically the 'Didactick' and the 'Rhetoricall'. A didactic discourse identifies those arguments that present 'both sides' of a question in a 'true light' with a view to persuade on the merits of their arguments, but no further. The rhetorical discourse attempts, primarily, to persuade by magnifying 'all the arguments on the one side and diminishes or conceals those that might be brought on the side contrary to that which it is designed that we should favour' (LRBL i.149. p 149; Compare with LRBL, ii.13-17. p 89-90). It was in this context that Smith reacted negatively to overblown contemporary classical forms of metaphoric discourse, adding that:

> 'It matters not the least whether the figures of speech are introduced or not. When your Language expresses perspicuously and neatly your meaning and what you would express, together with the Sentiment or affection this matter inspired you with, and when this Sentiment is nobler or more beautifull than such as are commonly met with, then your Language has all the beauty it can have, and the figures of speech contribute or can contribute towards it only so far as they happen to be the just and naturall forms of Expressing that Sentiment. They neither add to nor take from the beauty of expression. When they are more proper than the common forms of speaking then they are to be used but not otherwise. They have no intrinsick worth of their own. That which they are often supposed to have is entirely derived from the expression they are placed in' (LRBL, i.v.56–57. pp. 25-6).

David Andrews, in his paper on gravity, creates an opportunity for his readers to review Smith's teachings on the appropriate role of metaphors in modern English rhetoric – which was at this time undergoing a major revision as 17th- and 18th-century scholars questioned the classical norms of advocacy. Absent such reading of LRBL, it is risky to be confident about what Smith supposedly meant when he used, for example, the 'invisible hand' metaphor, or, as David Andrews argues, what Smith really meant by using 'gravity' as a metaphor in *Wealth of Nations* (Chapters I.vii-I.xip: pp. 72-275) when discussing natural and market prices.

The potential consequences of misreading the role of metaphors can be demonstrated by the impact of Paul Samuelson's best-selling textbook, *Economics: an analytical introduction* (1948), with approximately five million copies sold in 19 editions to 2010 (Kennedy, 2010). Samuelson arguably misled several generations of economists and public commentators by conflating Adam Smith's 'self-interest' with 'selfishness' in reference to the 'invisible hand' metaphor (Samuelson, 1948, p. 36). This – what is now widely regarded as a mis-reading – had a huge post-1948 impact on both scholarly and popular treatment of metaphors that can be seen in populist misunderstandings of the 'invisible-hand metaphor' (Kennedy, 2009; 2012; 2014). Similarly, for example, when Nobel Prize-winner George Stigler brought greetings, metaphorically, of an 'Adam Smith', supposedly 'alive and well and living in Chicago', who by implication endorsed Chicago's interpretation of modern economic policies, the metaphoric allusion did not work well because the views of the Chicago 'Adam Smith' were controversial assertions about the views of the Adam Smith born in Kirkcaldy, Scotland in 1723 (Fry, 1992).

In welcome contrast there was some excitement among a meeting of Smithian scholars in 2009, when news spread that Warren Samuels was near to completing his research into the history of Smith's use of the 'invisible hand' metaphor, which he had begun in 1983. I was among that happy audience when we heard the news. Warren Samuels, arguably the most diligent and thoughtful Smithian scholar since the 1940s, wrote extensively and authoritatively on Smith's scholarship and teaching. Unfortunately, Warren Samuels was unable to complete his book on Smith's teachings on the rhetorical use of metaphors in his time and ours, due to his serious illness while completing his powerful testament to his diligent and thorough research: *Erasing the Invisible Hand: Essays on an Illusive and Misused Concept on Economics*, (Samuels, 2011). Thankfully, Samuels's close academic colleagues, Marianne F. Johnstone and William H. Perry, assisted in preparing his final manuscript for publication, in which Samuels discusses in depth the role of metaphors, from Samuel Johnson's dictionary (1755), and later authorities, through to the early 21st century (Samuels, 2010, pp. 151-63).

Fortunately for posterity, Smith was very clear and specific on the role of metaphors in English rhetoric and in perspicuous writing, making his teaching on metaphors highly relevant in discussions on Smith's use of gravity as a metaphor. He defined metaphors as giving 'due strength of expression to the object described and at the same time does this in a more striking and interesting manner' (LRBL, p. 29; Kennedy, 2014).

Both *Moral Sentiments* (1759) and *Wealth of Nations* (1776) are 'tinctured strongly' with metaphors. Here are three examples from WN (II.ii.86, p. 321):

- Metaphor 1: 'the great wheel of circulation' — Object: 'the annual circulation of metal pieces …that distribute to every man [his] revenue';
- Metaphor 2: 'waggon way through the air' –- Object: 'the effect of the circulation of gold and silver, creating good pastures and fields';
- Metaphor 3: 'Daedalian wings' — Object: 'the insecurity of paper money versus the security of the "solidity" of gold and silver'.

In these examples, the metaphor is taken only figuratively, not literally: there is no 'invisible great wheel', there are no 'waggons' flying through the air, and nor were there a pair of actual feathered wings fixed by Daedalus onto his son's (Icarus's), arms with wax, to enable him to escape the Minotaur – his flight did not take place in reality – it was an imaginative myth, brilliantly transposed by Smith into a metaphor for less reliable paper money compared to solid gold.

Likewise, Smith's use of gravity as a metaphor did not imply Newton's nor Aristotle's/Empedocles's theories of gravity. Metaphors do not exist in reality; they are figures of speech used to 'describe' some object to readers familiar with classical mythology in the case of 'Daedalian wings' – 'in a more striking and interesting manner' (Smith, LRBL, p. 29). Of course, if Smith's readers had never heard of Daedalus, Icarus, or the Minotaur, the metaphor would remain obscure and they would miss Smith's brilliant metaphoric allusion.

The only guide we need to understand Smith's intended meanings when he uses metaphors is the certainty that they conform to his sense of perspicuous writing, which his well-chosen metaphors invariably demonstrated (though he admits, apologetically, that his 'waggon way' example was a 'violent' metaphor, WN II.ii.86: p. 321). Therefore, careless use of metaphors does not add to the important qualities of perspicuity that Smith admired and encouraged his students to develop and follow (LRBL, i.9.10: 6). He also made his intended meanings clear to readers by way of introducing some of his more tedious and notoriously difficult passages in *Wealth Of Nations* (WN. I.v: 47- I.xi.p: 267), including the unstable relationships of market and natural prices:

> 'I shall endeavour to explain, as fully and distinctly as I can, those three subjects in the three following chapters, for which I must very earnestly entreat both the patience and attention of the reader: his patience, in order to examine a detail which may, perhaps, in some places, appear unnecessarily tedious; and his attention, in order to understand what may perhaps, after the fullest explication which I am capable of giving it, appear still in some degree obscure. I am always willing to run some hazard of being tedious, in order to be sure that I am perspicuous; and, after taking the utmost pains that I can to be perspicuous, some obscurity may still appear to remain upon a subject, in its own nature extremely abstracted' (WN I.iv.18: p. 46).

We also have an example of the appropriate use and meaning of metaphors in relation to their objects from Smith's close, contemporary social friend, Hugh Blair – a popular, moderate Presbyterian preacher and Enlightenment colleague who, after Smith moved to Glasgow, in 1751, eventually took over his successful public subscription course of rhetoric lectures in Edinburgh (Ross, 1976, p. 96; 2011, p. 92). Smith also showed Blair some sheets of his lecture notes (Blair, 1812, ii.22 n.). Blair's and Smith's expositions of the appropriate role of metaphors were also consistent with modern English language usage (Simpson and Weiner, 2nd ed. vol. IX, p. 676). Up to the early 18th century, English had been dominated by ancient classical styles of rhetoric that Smith, Blair and other contemporaries rejected.

> 'When I say of some great minister that he upholds the state, like a Pillar which supports the weight of a whole edifice. I fairly make a comparison; but when I say of such a minister that, he is the Pillar of the state, it is now become a Metaphor. The comparison betwixt the Minister and a Pillar is made in the mind, but is expressed without any of the words that denote comparison. The comparison is only insinuated, not expressed: the one object is supposed to be so like the other, that, without formally drawing the comparison, the name of the one may be put in place of the other: "The minister is the Pillar of the state." This therefore, is a more lively and animated manner of expressing the resemblances which imagination traces among objects. There is nothing which delights the fancy more, than this act of comparing things together, discovering resemblances between them, and describing them by their likeness. The mind, thus employed, is exercised without being fatigued; and is gratified with the consciousness of its own ingenuity. We need not be surprised, therefore, at finding all Language tinctured strongly with Metaphor' (Blair, 1787, vol. 3. pp. 372-3).

3. Gravity as a Metaphor

The metaphoric meaning of gravity in the context described in *Wealth of Nations* is not bound by Newton's nor Empedocles' philosophical ideas of gravity. It was sufficient for perspicuity that readers of WN had some general idea of gravity as a mutually-related, analogous metaphoric description of the behaviours of people setting natural and market prices, as people on both sides of such transactions reacted to changes in their related and linked variables.Smith wrote of Newtonian mechanics as if it was the 'gold standard' for 18th-century science – see Smith's 'History of Astronomy', written during 1744-c.58; and published posthumously in 1795 (EPS, 1795. pp. 104–05). His private library also contained some of Newton's major works, including 'Opticks', 'Philosophie naturalis principia mathematica', and 'Fluxions and Infinite series' (calculus, etc.), none of which were essential pre-reading for readers of WN (Bonar, 1894. pp. 122-3). Smith, of course, was fluent in Latin – a prerequisite for his entry to a university as a student, and, later, for his professorial duties requiring him to teach classes in Latin, a practice that was gradually abandoned through to the mid-19th century (though I am informed that grace before meals is still recited in Latin in some Oxford and Cambridge colleges). He also understood Greek from his Kirkcaldy school days and he was familiar with the philosophical ideas of Aristotle and Empedocles.

Newtonian gravity was 'a system whose parts are all more strictly connected together, that those of any other philosophical hypothesis … that it decreases as the squares of the distance increase' (compare with the Sydney University Student newspaper, '*Honi Soit*', which often carried in the 1950s a definition of gravity in a boxed paragraph on its frontpage as: 'the mutual attraction of two bodies is inversely proportional to the square of the distance between them').

All bodies with mass exert gravitational pull on all others, but not all of them have the same mass or exert the same degree of mutual attraction that draws them physically towards each other or holds them in regular orbits. It does not follow that Smith's use of gravity as a metaphor described an observed or plausible relationship between market and natural prices, either of which were sometimes above or sometimes below the other's prices, as described in WN.

Smith's metaphoric use of gravity was not intended as a scientific statement about the physics of a gravitational attraction embodied in prices. He expresses his reservations twice, first writing: 'the natural price, therefore, *is as it were,* the central price, to which the prices of all commodities are continually gravitating' (WN I.vii.15: p.75, emphasis added) and then repeats it two pages later: 'the market price of every particular commodity is in this manner continually gravitating, *if one may say so,* towards the natural price' (WN I.vii.20: 77, emphasis added). Ultimately, production costs (as defined) must tend to be met by market prices, inclusive of the participants' profits, if economic production is to commence and continue. Natural and market prices do not exhibit the definable physics of 'mass', nor do they operate in a definable or predictable order. If Smith's metaphoric references were scientific statements, Newtonian or Epidoclean, Smith would have left out his semi-apologetic qualifiers because they would have been inappropriate, bearing in mind also that not all of his readers were expected to have studied classical or philosophical history.

Smith generalises, quite heavily, his metaphoric assertions about natural and market prices. Indeed he goes into detail about metaphorical gravity relationships: 'yet sometimes particular accidents, sometimes natural causes, and sometimes particular regulations of police, may, in many commodities, keep up the market price, for a long time together, a good deal above the natural price'.

Smith's reference to 'Police' in the 18th century referred to the regulations of governments to ensure:

> 'the attention paid by the public to the cleanliness of the roads, streets etc; and prevent the bad effects of corrupting and putrifying substances. 2nd, security; and thirdly, cheapness or plenty, which is the constant source of it. … The security of the people is the object of the second branch of police, that is the preventing all crimes and disturbances which may interrupt the intercourse or destroy the peace of the society by any violent attacks…' best brought about by '…the rigorous, severe, and exemplary execution of the laws properly formd (sic) for the prevention of crimes and establishing the peace of the state' (LJ p.331).

Smith's application of the gravitation metaphor captures the essence of his thoughts on the changing relationships bound into his concepts of natural and market prices in 'every society and neighbourhood', and for all commodities in them, over time. What affects the rent, labour and profits of stock for any commodity may affect their natural and market prices, as will changes in 'effectual demand', operating on them both in different degrees and circumstances, and for different time periods, from various sources. These forces motivate various chosen actions of individuals affected by them; their actions affect the forces and the consequential actions of other players, as they in turn are also affected by them.

Changing prices have no gravity-like mass, nor are they bound by the mathematical laws of physics. The human agents affected by changing prices are very much alive and can and do react with subjectively-motivated – not necessarily consistent – intent. Some react by doing without the goods on sale, others adjust the spread of their purchases; some producers withdraw from supplying goods that consistently do not earn their outlays, after, perhaps, selling their already produced goods at a loss, and others produce more output to gain additional sales at anticipated higher prices, or take their goods to neighbouring markets unaffected by localised trends in market prices. Markets are alive with conscious people whose considered actions may affect each other in numerous inconsistent ways, causing further actions and re-actions among people. Markets, if you like, are alive with people acting according to stimuli and are unlike physical objects that are bound together as planets with mass in fixed orbits, consistent with the laws of gravitational attraction.

Moreover, the relationships between natural and market prices uniquely consists of a feature not found in the physics of gravitational attraction between two bodies with mass. The market price of a product contains within it the natural price of that same product and, for that reason, the gravity metaphor does not transcribe into a purely physical gravitational relationship in the same way that two bodies with independent mass behave under the influence of the mutual attraction of their separate mass.

In the 18th century, Smith observed, society consisted of numerous local neighbourhoods, with numerous commodities entering and leaving these neighbourhoods under different conditions of local effectual demand and supply within chains of production and assembly under varying local conditions. Whatever else this analysis represents, it is not an image of single commodities from a single supplier and a single customer in a basic, permanent bilateral relationship – as represented in the standard, single-period, supply-and-demand diagram. Smith tackles the evident complexities in real-world markets head on to show the reality that natural and market prices are not always identically fixed, but change as they vary separately and reactively from various changing stimuli.

Natural and market prices are subject to changes determined at any one moment in complex interactions among people in many ways, that Smith describes as multiple, complementary, interactive and variable ways, over a total of 135 pages in WN (I. vii-xi: pp. 72-267). He addresses definitions of ‘Natural and Market prices’, variations in the ‘wages of Labour’; variations in ‘Profits of Stock’; differences in ‘Wages and Profits in Different Employments of Labour and Stock’, ‘Inequalities from the Nature of Employments themselves’, and ‘Inequalities occasioned by policy in Europe’, all of which – separately or together – make for an exhaustive treatment of the complexities implied in the metaphorical gravitating relationships between natural and market prices.

These very detailed chapters in WN (known to weary, impatient readers) are followed by long chapters covering variations in ‘Land Rents’ (WN I.xi), ‘digressions on variations in value of silver over last four centuries, and the progress of Improvement’. Together they constitute substantial evidence that the initial analysis of natural and market prices is not a simple statement of a singular concept suitable for a diagram or an equation. It is an attempt to describe and explain complex, changing phenomena in words. Trying to describe these many interactions is a much harder task for the clearest of thinkers who pay attention to Smith’s analytical descriptions throughout WN (I.ii - xi.p: 72-267). I remind readers to consult Smith’s advice (WN I.iv.18: p. 46) to those who weary of the details in his writings on what he regarded as important relationships between natural and market prices.

The sparse, modern S-D cross simplifies the reality of individual people, perhaps acting in concert, but not in tune, which can deprive readers of an appreciation of supply and demand in real life, as observable in the common, old-style street markets that abounded in Smith’s times. Reading these chapters in WN we may appreciate the relevance of Smith’s use of the gravitation metaphor to describe his observed relationships between what he called natural and market prices in the simplest of cases. Markets in Smith’s time were dispersed, as he would have observed from his intimate knowledge of local markets in Kirkcaldy’s long High Street, where he lived with his mother, and on his excursions from his mother’s house along the shoreline to the nearby busy Kirkcaldy harbour in the Firth of Forth (where his father had been a customs officer).

Smith, as a youth, was familiar with Scotland’s sea-going trade and even more so in later years when he was a Commissioner of Customs in Edinburgh (1778-90). From his office, high on the Royal Mile close to Edinburgh Castle, he and his subordinates could observe ships entering or leaving their anchorages at ‘Leith Roads’ in the Firth of Forth. He also lived in Panmure House (1778-90), just off the High Street/Royal Mile, further down the hill towards Holyrood Palace, along which he walked, or was carried by chair porters, each working day, passing directly through the bustling street markets of Scotland’s capital city. In London too, busy street markets were located close to Suffolk Place (the ‘Scotch quarter’), where he lodged for weeks at a time on his official visits to London. His practical experiences of noisy local markets and their mental images, gave him vivid ideas of how natural and market prices, and supply and demand, interacted in the real world, which he addressed in WN I.ii.vii.

The natural price was a commodity’s ‘central’ price of the moment, so to speak, not least because it reflects a commodity’s supply or cost-price from producers, which, when earned, repaid the producer’s costs, plus his expected profit. That price was ‘precisely’ what the product was worth, or what it really cost the person who brought it to potential sellers in markets where prices were determined by ‘effectual demand’ and not by their product costs. That price was likely to be very much to the fore in producers’ minds, which was therefore likely to animate their actions (‘His profit, besides, is his revenue, the proper fund of his subsistence’). But what was sufficient in one period and circumstance to meet a producer’s costs and profit may be insufficient or more than sufficient in other periods because costs may change. (Product inputs could change without the producer's control as landlords' rents, labourers' wages, and other costs changed unilaterally, not necessarily influenced by effectual demand at existing market prices.) If for any reason a period's natural prices were not matched by their market prices, the seller's income could fall below his expectations and not repay him 'what they may very properly be said to have really cost him' (WN I.vii.6, pp. 72-3). These falls provoked conscious, consequential actions by sellers. Actual market prices could fall below a producer's total costs and, should that situation last for 'any considerable time', the producer may 'change his trade', with the caveat that such a consequence would obtain where there was 'perfect liberty' to do so (WN I.vii.6: 73).

Smith summarises the meaning of market prices:

> 'The market price of every particular commodity is regulated by the proportion between the quantity which is actually brought to market, and the demand of those who are willing to pay the natural price of the commodity, or the whole value of the rent, labour, and profit, which must be paid in order to bring it thither' (WN I.vii. 8, p. 73).

Those buyers willing to pay market prices constitute the effectual demand, which was the reference point for the producers to plan their activities. When producers bring to market insufficient products to meet the effectual demand at existing prices, then some (not all) buyers, rather than do without the product, could offer to sellers higher prices and thereby bid market prices upwards 'according as either the greatness of the deficiency, or the wealth and wanton luxury of the competitors happens to animate more or less the eagerness of the competition' (WN I.vii.9, p. 74). Similarly, when the quantity brought to market exceeds effectual demand:

> 'it cannot be all sold to those who are willing to pay the whole value of the rent, wages and profit, which must be paid in order to bring it thither. Some part must be sold to those who are willing to pay less, and the low price … must reduce the price of the whole. The Market price will sink more or less below their natural price according as the greatness of the excess increases more or less the competition of the sellers, or according as it happens to be more or less important to them to get immediately rid of the commodity' (WN I.vii.10, p. 74).

In short, market prices respond to effectual demand, tending to rise in times of shortages in supply and to fall in times of surplus supply. Perfect coincidences in effectual demand and actual supply are not guaranteed, and the necessary adjustments to actual demand and actual supply may take time to settle. All these explanations of shifts in supply and demand, offers and counter-offers, relate to the relationship of effectual demand to actual supply in adjusting selling and buying prices. All parties to these transactions, such as: landlords – who adjust the amount of land they rent; labourers – who adjust their hours of labour from the stock of labour involved in production; and employers – who adjust their capital stock involved in production to raise or lower the natural prices of the product, combine to satisfy net effectual demand. Of course, there are inevitable time-lags as the factors of production, land, labour and capital, complete their inevitable readjustments in the real world.

Crucially, writes Smith, introducing the gravitation metaphor: 'the market price of every particular commodity is in this manner continually gravitating, if one may say so, towards the natural price, yet sometimes particular accidents, sometimes natural causes, and sometimes particular regulations of police, may, in many commodities, keep up the market price, for a long time together, a good deal above the natural price' (WN I.vii. 20, p. 77). Smith's choice of the 'gravitation' metaphor certainly 'describes in more striking and interesting manner' its object, namely the way in which changing market and natural prices seem to oscillate about each other because, while they are separate elements in a continuous and changing process of price determination, they are also related to each other – depending on which phase in their relationship we observe. The component prices upon which potential suppliers of marketable goods sluggishly base their decisions to supply products to markets and market sellers react to changes in the effectual demand of final consumers, both are influenced by changes in the demand for their products at existing prices (WN I.vii.1-21, pp. 72-77). Final buyers may buy more or fewer of the goods in the market, but sellers adjusting to the prevailing effectual demand may take longer to adjust to the sources of their supply. Moreover, in the following chapters, Smith discusses the many circumstances that can affect the reconciliation of 'sellers' and 'buyers' changing offer-prices (WN I.vii to I.xi, p. 267).

Markets are more messy than instantaneous adjustments summarised by S-D cross diagrams. The players are 'naturally prompted' by changes in 'effectual demand' to adjust their behaviours to produce profitable 'natural prices' for producers and profitable 'market prices' for market sellers. But seamless or tidy it is not; messy may be the norm. Smith was concerned with outlining the mechanism by which natural and market prices may be reconciled – broadly by suppliers acting individually, ideally to bring about 'that precise quantity' which 'may be sufficient to supply, and no more than supply, that demand' (WN I.vii. 16, p. 75). From this point he paints in the real-world complications as buyers and sellers imperfectly try to co-ordinate their actions. He discusses variations in the quantities produced in different years (WN I.vii.17m p. 75) and their 'fluctuating' effects on 'natural prices', especially that part of the influences on 'wages and profits' and such fluctuations as affect both the values and net rates of wages – 'raising' hours of labour when 'understocked' or falling when 'overstocked' with labour, or 'sinking' as wages change 'prices' (WN I.vii.18, p. 76).

Market-day prices could change according to the composition of buyers during any particular market day or season and changes in the scarcity or abundance in the supply of products for various and multiple reasons. If a producer earned more than the natural price, she earned extra profits over her initial natural costs of the products she brought to market for sale. Market prices are decided by reconciling fluctuations in price offers and their acceptability to players seeking to buy products through bargaining processes. Such bargaining processes are dominated by subjective behaviours that are not, in any sense, as predictable as planetary and other moving inter-planetary objects, such as meteors, comets, and space debris, with mass, that move in their orbits and in velocities that can be predicted years in advance, like eclipses of the Moon or Sun. In markets, changes in the effectual demands of buyers can cause changes in market selling prices, and changes in producers' costs can also cause changes in producers' selling prices – or more correctly, *perceived* changes in the variables affecting prices may provoke changes in buyers' and sellers' perceptions of their prospects of settling their transactions at earlier expected prices and how likely changing current prices might affect their chances of finding partners willing to settle their transactions on mutually favourable, or least damaging, terms. Sellers depend, as do buyers, on their skills at bargaining and persuasion, as outlined in WN (I.ii, pp. 26-7) and in TMS, where Smith discusses discords and concords between humans in their exchange relationships and conversations: (cf. TMS, 16; 19; 21; 23; 25; 42) to obtain what they want by 'addressing the self-love' of those with whom they higgle and haggle.

Clearly, unlike astronomical data, price changes are less predictable; they are more like unpredictable tsunamis, volcanic eruptions and earthquakes. Self-interested sellers and buyers are not immune to the specific, often local, market conditions prevailing at any one moment, and rumours circulating of varying reliability. Self-interested participants in markets are in mutually-influenced transactional, human relationships. To argue that self-interested sellers and/or buyers, who act in markets in pursuit of their narrowly focussed self-interests, are somehow immune to the self-interests of those with whom they attempt to bargain, is a severely over-simplified assertion by those economists who narrowly interpret Smith's writings on conditional bargaining (WN I.ii. 2-3, pp. 26-7). It is also contrary to the experience of anybody who has negotiated to buy or sell anything in markets that operate in the real world, or, as I have often observed, who heatedly argue over their budgets in every university department and business school that I taught in during 1971-2005 (see Kennedy, 1997).

Smith's literary descriptions necessarily are more than a trifle verbose when he discusses the complex interactions from ever-changing market prices that may not clear instantly or quickly. Smith attempts to describe the resulting interacting changes from 'different accidents', when market prices are sometimes 'suspended a good deal above' and sometimes they are forced 'even somewhat below' natural prices. By using gravitation as a metaphor, Smith was able to describe 'whatever may be the obstacles which hinder them from settling in this center of repose and continuance, they are constantly tending towards it' (WN I.vii.15, p. 75). But that 'centre of repose' may itself be constantly shifting about in the real world.

Therefore, Smith uses the gravitation metaphor to describe the connected relationship of the variables in natural and market prices. He was, as his friend and colleague, Hugh Blair, put it, using a metaphor in 'a more lively and animated manner' to express 'the resemblances which imagination traces among objects.' (Blair, 1787, pp. 372-3).

Interestingly, Cantillon (1755) used a different gravity metaphor to describe the resemblances between, what amounts to, the natural and market price relationship, by referring to gravity as a 'perpetual ebb and flow in market prices' and their 'invarying intrinsic values', around what Smith called their natural price (see Cantillon, R. 1734, 1964, p. 31). The motion of the tides is, of course, indirectly related to the physical *gravitational* attraction of the Moon as it orbits under the actual gravitational pull of the Earth. Both Cantillon and Smith expected their readers to appreciate the metaphor's applicability in purely rhetorical terms and not as strictly determined or bound by the eternal and determinate laws of physics.

Exchanges between suppliers-to-markets and buyers-in-markets are neither strictly rule-based nor predictable. They are speech-laden, not silent, and what is said affects the participants and often leads to subsequent actions by them, and these actions have both intended and unintended consequences, affecting their experiences and their exchange behaviours in future markets. Markets are not silent, mechanical affairs under unchanging physical laws. Market prices rise and fall as do natural prices. Both market and natural prices influence each other, as do conversations and consequential actions between sellers and buyers.

Smith's metaphorical gravitation, such as it was, focussed on debate and rhetoric which did not embrace philosophical distinctions.

Acknowlegements

I thank Craig Smith, Willie Henderson, Geoff Harcourt, David Andrews and the editors of *Economic Thought* for their helpful comments and suggestions.

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SUGGESTED CITATION:

Kennedy, G. (2015) 'Adam Smith's Use of the "Gravitation" Metaphor'. *Economic Thought*, 4.1, pp. 67-79.
http://www.worldeconomicsassociation.org/files/journals/economicthought/WEA-ET-4-1-Kennedy.pdf