Whisky-Manure Engines and "Haut, Fiery Gouts": The Scotch Whisky Industry and Its Causal Relation to Scotland's Economic Transformation

Peter deH. Caldwell[1]
Independent Scholar

Scottish economic and social relations changed dramatically in the century following the 1707 Union of Parliaments. Scotland progressed from an overwhelmingly agricultural, "puir" debtor status to a fast follower position against industrializing England. Economic historians have failed to explain how such an extraordinary development process happened – leaving a gap in the historical record and in our understandings about how backward countries achieve economic transformations. This paper defines how Scottish economic growth and development began and argues for a specific cause: the emerging Scotch Whisky Industry. It also argues that the industry's effects created positive outcomes outweighing the often-cited socially harmful abuses of spirits.

The unfolding story reveals how the Scottish agricultural economy, strongly synergistic to the whisky industry and stimulated by it, moved from the Old Agriculture to the New Husbandry and released labor and generated surplus capital to supply an emerging industrial sector. The whisky industry also stimulated intermediate goods supplies that helped create the technology and skills infrastructure for an industrial revolution. The whisky case study reveals an engine for economic development appearing at the nexus of market opportunity, technological advancement, and institutional change – including but not limited to the unintended consequences of government regulation.

Discovering the "Cause of Improvement": Whisky-Manure Engines

> Of all the commercial advantages which Scotland has derived from the union with England, this rise in the price of cattle is, perhaps, the greatest...– the principal cause of...improvement.
>
> –Adam Smith, *The Wealth of Nations*

[1]I would like to gratefully acknowledge the contributions to this paper made by Drs. Ronald Weir and Michael Moss, of the universities of York and Glasgow respectively, and also that of Dr. Fred Carstensen, my major advisor at the University of Connecticut.

BUSINESS AND ECONOMIC HISTORY, Volume twenty-five, no. 1, Fall 1996. ISSN 0849-6825.

Cows do not represent a glamorous beginning to a nation's economic development. Nevertheless, well before the Union of Parliaments, perceptible change began appearing on the face of Scottish agriculture. The Union merely made agricultural goods trading certain and irreversible. Subsequently, several combined economic factors worked to produce the cattle price rise that Smith states as the cause of "improvement" [9, I.xi.1.3].

Three fundamental historical facts document Scottish agriculture's changing nature beginning in the late seventeenth century. T.C. Smout presents the evolving picture:

> In 1611-14 hides and skins, raw wool and grain accounted for nearly half the total value of seaborne trade, apart from the "greit quantitie" of sheep and cattle "transpoirtted be land dailie" [11, p. 206].

By the eve of the Union one hundred years later, many more live cattle had replaced hides as the primary export to England – the first fact. Where cattle had only entered North of England markets in the early 1600s, a great drovers' road opened all the way to London late in the century; cattle drives began in the Borders and continued for 450 miles to the great metropolis.[2] Also after about 1660, a great conversion of waste commons used for grazing to land under tillage began in Lowland Scotland, the second fact. As the third fact, a remarkable corn trade arose carried on by sea from the fertile northern firths and carses to the population centers on the Forth [11, p. 208]. These trends contain contradictions that call into doubt Smith's source for Scottish "improvement."

The Black Cow Conundrum

Smout realizes that he has introduced a major difficulty for which he has no satisfactory answer: where did the growing numbers of black cattle come from if the pasturage progressively shrank? "The motives and methods behind this transformation remain obscure," he admits. "Possibly the widespread use of lime enabled more outfield to come under the plough." Or, perhaps the nobility engaging in enlargements and consolidations of their holdings had something to do with it [11, p. 207]. But such reasoning merely indicates that one has found one's way into a box: the Black Cow Conundrum. Lime could not have done it, only manure – and lots of it.

Solving the black cow problem involves breaking a contradiction; increasing the cattle population to gain more manure to expand the arable meant escaping the bare-sufficiency, timeless equilibrium of the intensive land use Old Agriculture where limited fertilizer worked as a binding double constraint.

---

[2]Adam Smith remarked upon these vast cattle drives, and noted that cattle represented the only product that cost less to transport by land than by sea – provided enough roadside grazing existed [9, I.iv.2.17].

Manure Theory

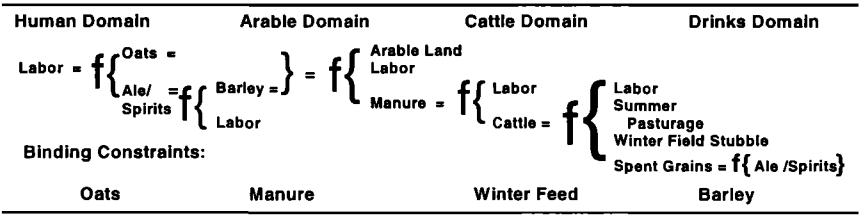
> ...the quantity of well-cultivated land must be in proportion to the quantity of manure which the farm itself produces; and this again must be in proportion to the stock of cattle which are maintained upon it.
>
> –Adam Smith, *The Wealth of Nations*

Manure mattered. Its quantity determined the equilibrium levels for arable and pasture; a farmer's wealth-maximizing behavior involved adjusting cropping and cattle to the ever-present manure constraint, always binding when extensive farming could not get carried out on fertile virgin land.[3]

The basic agricultural economics captured by Adam Smith differs strikingly from the modern model – where fertilizer represents merely one of a number of inputs that the farmer has available in any quantity at a market price [9, I.xi.1.3] The modern farmer's maximization problem involves determining which single crop output bundle will generate the most profit. Old Agriculture farmers had to produce both cereal grains *and fertilizer itself* – under a poorly understood production function within a production function in which animals represented mobile dung factories. Cattle linked the two production functions together. Farmers kept cattle not for their food value; peasants rarely ate meat. They kept cattle as household wealth stores and to equilibriate between their two production functions – oats and barley for human food and alcoholic drinks consumption, and manure for maintaining the arable's fertility. Cattle also constituted concentrated, mobile protein stores efficiently nourishing the small urban centers' populations engaged in materials transforming and trading activities supporting the agricultural mainstay.

Figure 1 captures the Old Agriculture's production interrelationships.

Figure 1: Old Agriculture Production Function Relations



Notice that the economic order weaves cereal grains, cattle, and alcoholic drinks together inseparably. Two understandings prove critical to unraveling the cow problem: One, the malted barley used in ale/spirits production does not get consumed; as spent grains, it feeds cattle. Two, winter feed constitutes the

[3]Sinclair estimates that only about 15% of the total Scottish land mass consisted of land naturally fertile enough for extensive agriculture; the rest was too infertile and required heavy manuring and liming for conversion into arable [8, II, p. 10].

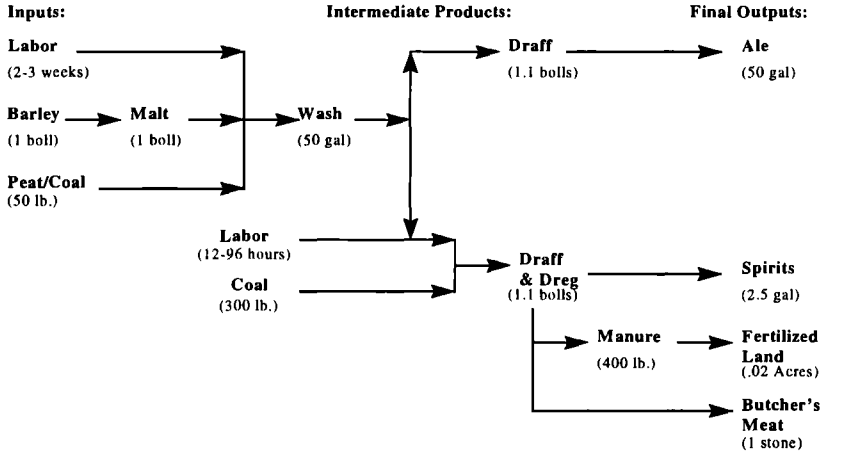
binding constraint upon the cattle herd's size. The implications of these two understandings follow below.

Breaking the Bind on Agricultural Growth: the Whisky-Manure Engine

> The lands that were kept constantly well manured and in good condition, seldom exceeded a third or a fourth part of the whole farm...
>
> Adam Smith, *The Wealth of Nations*

Smith saw a Scottish agriculture constrained by the manure bind; he missed seeing not only an industrial revolution but also an agricultural one – for by 1800, the typical farm's manured cropland and improved (fertilized) pasture would approach one hundred percent [9, I.xi.1.3; 3, p. 350]. Scottish agriculture expanded enough to feed an exponentially growing population that doubled in roughly one hundred years and became over 30% urban, up from about 8% in 1700. Improving enough wasteland to feed such a population required a manure surplus of some 34 million tons.[4] Where did it all come from? Find the source for the missing manure, and the Black Cow Conundrum unravels: surplus manure could *expand* the available fertile land for both cattle and cereal grains.

Figure 2: Input-Output Table for Scottish Drinks Subsidiary, Circa 1700



Source: Compiled from numerous references within *Distilleries in Scotland*, especially 1799, pp. 448-452, and from the Bunnahabhain Distillery Coal Statements.

[4]This and all subsequent input-output estimates for the Scottish agricultural economy derive largely from the British Parliamentary Select Committee's findings on the *Distilleries in Scotland* [2].

The Old Agriculture's rhythm of work and the whisky industry's input-output relations provide the solution, presented in Figure 2 above. At the harvest's end in October, otherwise slack labor went toward making ale and its distillation – whisky. Unlike ale, whisky had a long shelf life and needed to get run off in winter. The unintended consequence of peasants' demands for spirits increased the values of two critical economic variables: human effort and winter cattle feed. Whisky's value called forth efforts in tending fields that increased outputs for both barley and oats; it also commanded barley imports from the rich northeast of Scotland and East Anglia. Spent grains from distilling, fed to cattle, increased the size of the winter herd. Each cow wintered rather than slaughtered yielded 10 additional tons of manure from an expenditure of 1 1/2 bolls of spent grains. The process constituted a form of growth engine. Barley fed into the engine generated not only the high-value-added spirits final product, it also gave as a free gift a valuable cattle feed producing another final product, butcher's meat. Feedlot activities in turn gave the free gift of manure that could get invested in wasteland improvement, extending the nation's arable acreage.

Taken together, the combination of marginal additional human energy devoted to tending crops and distilling spirits and winter feed leveraging the cattle herd size yielded the necessary additional manure and surplus labor and capital to make possible Scotland's conversion to both the New Husbandry (which required fertile pasturage) and the new manufactures that shaped an industrial revolution.

A License to Cheat Creates the Sufficient Condition for an Industrial Revolution

Scottish government efforts to tax the drinks subsidiary via a malt excise began, ineffectually, around 1700. By then, the infant whisky industry had existed for some fifty years, ale production for thousands. Taxing the high value added spirits industry did not become a serious government enterprise until the war with the colonies made revenue generation paramount. Parliament first tried applying the English system (called the "Survey" for its basing taxation upon actual quantities produced) upon the Scots in 1784; large-scale cheating occurred. For the Scots, as Burns wrote, "Freedom an' whisky gang thegither" [1, p. 119]. Parliament quickly shifted in 1786 from its taxation principle based upon measuring frequently elusive production flows to one based upon licensing fixed productive capacity – a capital stock concept. The results constitute a stunning example of how the unintended consequences of government regulation can reshape an entire industry, economy, and social order.

A License to Cheat

The new 1786 System of License in effect required a distiller to pay a year's excise tax on estimated production up front – an onerous burden that forced many undercapitalized distillers into illicit operation, since the tax

comprised over half the product's total value at wholesale [4]. The distiller had a third choice, however, and this choice could vastly reduce taxation quite legally: the distiller could choose to improve the throughput of his production plant, thereby spreading the one-time licensing tax out over more volume. To do so, the distiller had two degrees of freedom within the law. The license amount got based upon still size in gallons and assumed a two-day cycle time; so, the distiller could simultaneously reduce still size and cycle time. Halve the still capacity and the cycle time and the distiller halved the effective tax with no loss in volume. Not surprisingly, the System of License set off intense interfirm competition to lower cycle times, as well as intense design innovation aimed at producing small, fast run-off stills.

Parliament's perverse response came in the form of annually increasing licensing rates, the annual license rate per gallon of capacity went from £1 10*s*. in 1786 to £108 ten years later [4]. During that time period, the achievable cycle time for Lowland distillers went from 8 hours to an incredible 2 1/2 minutes to load, heat, distil, and discharge a still's contents![5] Clearly, Parliament played out a losing hand during this period; the tax *rate* increased tenfold, but the tax *take* scarcely changed at all. In the process, Parliament unintentionally set in motion a ferment in Scottish design and metal-bashing skills that would help create the machine making infrastructure essential for an industrial revolution.

Scotland's First Large-Scale, Vertically-Integrated Firm

Parliament also unwittingly created the artificial, regulatory-induced incentives that called into being Scotland's first large-scale, vertically-integrated firm. That first firm owned by the Haig's did not operate within the historian's holy trinity of coal, iron, and textiles; it distilled whisky. In order to gain scale economies, it integrated backward into barley raising and horizontally into feedlot operations to utilise its spent grains by-products; the manure yielded by feedlot operations in turn went back into the soil to increase barley outputs. It shipped cattle by land down the drovers road to London; it dug a canal and purchased a vessel, both to facilitate its entry into the great London wholesale spirits market. It largely created the market for mass consumption spirits goods. At its late eighteenth century peak, the firm made revenues of some £75,000 to £85,000 annually. And, it made the biggest sequestration proceeding to date in the Scottish nation when forced into bankruptcy by Parliamentary action in 1788 [7].

[5]Various cycle time claims appear in *Distilleries in Scotland* [2]. The whole experience gave some distillery personnel the mental image of a truly *continuous* process – realized in actuality some thirty years later when two distillery men achieved discrete, simultaneous discoveries that made continuous, fractional distilling feasible, providing the bedrock technology for the future petroleum industry.

Government Regulation *Creates* a Product

The layman's impression that government merely set out to tax the product that we know today turns out false upon examination. The late eighteenth century Lowland distillers' hastily distilled product possessed truly horrible characteristics; early whiskies – possessed of a strong taste, "a haut, fiery gout" – could even prove fatal to the drinker. Nor did they receive ageing, instead frequently being consumed whilst still hot from out the still. Scotch Whisky as we know it instead represents the nineteenth century bastard creation of government regulation gotten upon an industry forcibly seduced by Parliament. Three successive waves of regulation shaped the homogeneous, aged and blended bottled whisky product of our own century, as distilling entrepreneurs responded to the signals from both the marketplace and the regulators.

The first, 1823 reform of government behaviour permitted distillers to hold spirits in bond until sold, not paying tax until withdrawal [6]. Distillers shortly switched from illicit to legal operations. The new continuous distillation yielded neutral spirits suitable for industrial solvents users; traditional pot still makers produced a plethora of unique, richly flavoured "self" whiskies for human consumption. The industry's two branches appeared ripe for divorce – the 1855 Methylated Spirits Act required adding a noxious poison to neutral spirits destined for industrial uses in return for eliminating their taxation. Then in 1860, Parliament acted to allow spirits' vatting and blending in bond – an act bringing the industry's two branches back together, and into battle over the value added [12]. The new delayed taxation incentive for these activities set off an explosion in particularly blended products in which small amounts of many different self whiskies got added to a main product base of cheap neutral spirits, yielding a blander but homogeneous drink. "Scotch and Soda" soon entered convivial vocabularies. Still later, bottling in bond legislation set the incentive for the branded, bottled whisky revolution driven by the techniques of modern marketing [5]. The large Lowland distillers amalgamation won the battle for control of the industry [13].

"Haut, Fiery Gouts": Demands for Ardent Spirits

Strangely little has been written about the matching demand side in the economic equation to the spirits supply side revolution. The tacit model has been the inebriated worker one, with its interpretation of whisky as a nasty product used merely for drunkenness – ignoring the model's attendant contradiction that agricultural and manual workers labored soberly and very hard indeed merely to dissipate their wealths irrationally. Whisky – the distillation of Life's Joy – instead appears to have satisfied a great many human needs – social, medicinal, political, psychological, and spiritual. Robert Burns in "Scotch Drink" captures a social order into which whisky weaves itself inextricably while remaining morally neutral [1, p. 97].

The rational reasons now appear for some one-half of Europe's international trade taking the form of wine and then spirits, for many centuries. For many people largely dispossessed of their individual property rights in Life's Joy, the sum and substance of what Adam Smith termed the purpose for all the "toil and bustle of this world," and perceiving their subjective time horizons likely to be Hobbesian – "nasty, brutish, and short" – the rational response has become to seek out a measure of spiritual Joy through "inebriating liquors" [10, I.iii.2.1]. True in the eighteenth century for Scottish peasants, and equally true today for inner city minority residents, drug cultures have gotten triggered by a people's sense of dispossessed property rights to those intermediate goods between necessities and pure Joy. At the limit, expecting life's span to be short, and stinted severely in Joy, drug culture people turn to seizing immediately, and frequently illegally, the purest physical analogues of spiritual Joy readily available. *Carpe diem.*

References

1. *The Complete Illustrated Poems, Songs, and Ballads of Robert Burns*, ed., Samuel Carr (London 1905; reissued 1990).
2. Distilleries in Scotland, reprinted *in House of Commons Sessional Papers of the Eighteenth Century*, vols. 119 & 125 (Wilmington, Del., 1975).
3. James Headrick, *A General View of the Agriculture of the County of Angus, or Forfarshire; with Observations on the Means of its Improvement* (Edinburgh, 1813).
4. The Licensing Act, 26 George III. cap. 64.
5. Michael S. Moss and John R. Hume, *The Making of Scotch Whisky: A History of the Scotch Whisky Distilling Industry* (Edinburgh, 1981).
6. Reforming Act, 4 George IV. cap. 94 and *Report from the Chairman of the Board of Excise, Scotland,...respecting the Distillery Laws*, vol. XXI. 175ff.
7. Scottish Records Office, #2080 James Haig and Company Sequestration Papers, Sederunt Book (1788-94) ex cs. 230/2/15.
8. Sir John Sinclair, *Analysis of the Statistical Account of Scotland, with a General View of the History of that Country and Discussions on some important Branches of Political Economy*, 2 parts (Edinburgh, 1825).
9. Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations* (London, 1776; reprint Oxford, 1976).
10. Adam Smith, *The Theory of Moral Sentiments*, (London, 1759).
11. T. Christopher Smout, Scottish Trade on the Eve of the Union, 1660-1707 (Edinburgh, 1963).
12. Spirits, 23 & 24 Victoriae. cap. 114.
13. Ronald Weir, *The Distilling Industry in Scotland in the Nineteenth and Early Twentieth Centuries* (Ph.D. Dissertation, University of Edinburgh, 1974).