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Jaffé, William (1898–1980)

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Historian of economic thought whose important contributions were to the study of the work of Léon Walras, Jaffé was born in Brooklyn on 16 June 1898 and died in Toronto on 17 August 1980. He graduated from City College of New York with an AB degree in classics and English (1918), from Columbia University with an MA in history (1919), and from the University of Paris with a *Docteur en droit* in economics and political science (1924). He taught economics at Northwestern University (1928–66), and at York University in Ontario (1970–80). Jaffé translated Walras's *Eléments d'économie politique pure* into English (Walras 1954), thereby providing a major stimulus to the study of his work; edited and exhaustively annotated Walras's scientific correspondence and related papers (Jaffé 1965a), thereby furnishing an encyclopedic storehouse of information about his writings; and wrote many essays on Walras's economic ideas (Walker 1983a, b). Jaffé believed that, even in its scientific aspects, a writer's work reveals the influence of his normative views and intellectual environment, and that to understand his work fully it is therefore necessary to study his biography and the era of which he was a part (Jaffé 1965b). He applied this thesis to the study of Walras's work, examining the aspects of his biography that had a bearing on his theories, explaining the antecedents of his scientific ideas and the philosophical sources of his normative conceptions, and interpreting and assessing his theories of demand, exchange, production, capital formation, money, tâtonnement, and general economic equilibrium.

In an extreme change of opinion, Jaffé came to believe, in the last seven years of his life, that Walras's theory of general equilibrium was intentionally a normative scheme, and that his theory of tâtonnement was intentionally a normative exercise in static analysis (Jaffé 1980, 1981). It would be a disservice to Jaffé and a denial of his scholarship not to recognize that his soundest judgements on Walras were made during the first 43 years of his study of Walras' work, when he regarded Walras's economic theories as positive in intent and character and the theory of tâtonnement that Walras espoused during most of his career as an attempt to describe the general features of the dynamic adjustment of the market system toward equilibrium (Jaffé 1967).

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Japan, Economics in

Tamotsu Nishizawa and Aiko Ikeo

Abstract

Economics in Japan seems to have developed in two major different ways, political economy and neoclassical economics. The traditional notion of 'administering the nation and relieving the suffering people' continued to exert a strong influence on political economists. The German Historical School and then Marxian economics also maintained their very strong traditional hold up to the 1960s, as in other late-developing countries. Neoclassical and Keynesian economics began to develop in the 1930s. Some theoretical economists began to make international contributions to studies of the general equilibrium approach, welfare economics, and trade theory in the 1950s.

Keywords

Akamatsu, K.; Amano, T.; Amonn, A.; Aoyama, H.; Arisawa, H.; Ashley, W. J.; Bastable, C. F.; Brentano, L.; Brouwer's fixed-point theorem; Cambridge School; Carey, H. C.; Chenery, H.; Civil Society School; Cobweb theorem; Comparative advantage; Cournot, A. A.; Developmental state; Differential–difference models; Dual structure; Econometric Society; Economic development; Ely, R. T.; Engel's law; Fenollosa, E.; Fixed-point theorems; Free trade; Fukuda, T.; Fukuzawa, Y.; Furuya, H.; General equilibrium; German Historical School; Gossen, H. H.; Hayakawa, M.; Hecksher–Ohlin trade theory; Hirai, Y.; Hobson, J. A.; Ichimura, S.; Inada, K.; Industrial policy; Infant-industry protection; Inoue, T.; International division of labour; International trade; Ishibashi, T.; Japan, economics in; Japanese Economic Association; Kakutani's fixed-point theorem; Kanai, N.; Kawakami, H.; Kemp, M. C.; Keynesianism; King's law; Kitamura, H.; Komiya, R.; Koza School; Kumazawa, B.; Kushida, T.; laissez-faire; Law of demand; Leontief, W.; Liapunov, A. M.; List, F.; London School Institutionalists; Marshall, A.; Marxism; Masuji, Y.; Mathematical economics; Mill, J. S.; Ministry of International Trade and Industry (MITI) (Japan); Miyamoto, K.; Moore, H. L.; Morishima, M.; Nakayama, I.; Negishi, T.; Neoclassical economics; Nikaido, H.; Ohkawa, K.; Okawa, M.; Okita, S.; Oniki, H.; Otsuka School; Ouchi, H.; Over-consumption; Oyama, M.; Partial equilibrium; Persons,

W. M.; Pigou, A. C.; Planning; Poverty; Retirement; Ricardian trade theory; Rono School; Roscher, W. G. F.; Roundabout production; Sato, N.; Schumpeter, J. A.; Separability; Shibata, K.; Shimomura, K.; Shinohara, M.; Smith, A.; Socialism; Sono, M.; Stability; Stackelberg, H. von; Sugimoto, E.; Taguchi, U.; Takano, I.; Takashima, Z.; Takata, Y.; Tariffs; Tobata, S.; Tsuru, S.; Two-sector models; Uchida, T.; Uchida, Y.; Ueda, T.; Uekawa, Y.; Uno, K.; Uzawa, H.; Wadagaki, K.; Wage differentials; Wagner, A.; Walras, L.; Watanabe, T.; Webb, B. and S.; Welfare economics; Yagi, Y.; Yamada, I.; Yamada, M.; Yamada, Y.; Yasui, T.

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Economics and economic thought in Japan have changed and progressed in response to various phases of Japanese historical and social development. The Meiji Restoration of 1867 and the Second World War were the two most obvious phases. Before the Meiji Restoration, there were very marked differences between Japanese and Western approaches to economic problems, though even in the Tokugawa era (1603–1867) problems common to East and West seem to have generated some similar economic answers. When Japan opened up to the West in 1867, and when the state came to play a vital role in retaining national independence and promoting rapid industrialization, it is hardly surprising that the ideas of laissez-faire had less appeal than the nation-centred developmentalism of the German Historical School, which was propagated largely from (Tokyo) Imperial University (founded by the government). However, there also existed in Japan a tradition of British liberal economics, especially at the private universities (such as Waseda) and the Higher Commercial Schools (such as Hitotsubashi) (founded by the private citizens). Further, the traditional Japanese notion of the 'economy', as it says in Confucianism, 'administering the nation and relieving the suffering people', continued to have a strong influence on Japanese political economists even after the Second World War, while the notion of economics as 'science' rather than an 'art' – the modern neoclassical view of economics – was, with a few exceptions, generally put to one side, particularly before the Second World War.

From the Meiji Restoration to the First World War: The Making of Modern Economic Thinking in Japan

With the Meiji Restoration, the flow of Western ideas into Japan turned into a flood, and the study of Western economic ideas and institutions was incorporated into Japan's new knowledge. Though Western economic liberalism awakened modern Japanese intellectuals, it is helpful to think of pre-Meiji traditions of knowledge as providing the framework that determined the types of Western ideas that were widely accepted. Japanese thinkers selected certain parts of Western knowledge as relevant to their interests and gave them a Japanese interpretation.

For the economic thinkers of the early Meiji era, the simultaneous introduction of an industrial capitalist system and its institutions and of Western theories was to create formidable intellectual problems. Two major intellectuals, Yukichi Fukuzawa (1835–1901) and Ukichi Taguchi (1855–1905), were deeply committed to the so-called 'civilization and enlightenment' movement and interested not just in economic thought, industry and trade, but in a wide range of subjects related to the humanities and morality. Fukuzawa aimed to promote civilization by advocating 'wealth' and 'virtue' as means of retaining national independence and of making Japan develop into a strong and wealthy nation, and so suggesting a protectionist policy. His attempt to provide a realistic response to Japan's situation meant that his views and ideas were complex, but this very complexity fostered many good economists, industrialists and businessmen, who studied at Keio Gijuku (later Keio University), which he founded in 1858.

On the other hand Taguchi (1878), the author of Japan's version of 'Manchesterism', believed

in a harmonious natural law and the universal applicability of free trade. He took forward the banner of laissez-faire doctrine in Meiji Japan with his journal *Tokyo Keizai Zasshi* [Tokyo Economist], which was founded in 1879 and remained active until 1923. Another major journal, *Toyo Keizai Shinpo* [Oriental Economist] was founded just after the Sino–Japanese war (1894–5), at the time of Japan's first industrialization, and edited by people such as Tameyuki Amano (1859–1938), a liberal economist at Waseda who had translated J.S. Mill's *Principles*, and by his pupils. This journal propagated the ideas and policy of new liberalism in Japan, and from 1924 was edited by Tanzan Ishibashi (1884–1973). Ishibashi was active in debates on lifting the gold embargo and later became finance minister (1946–7); he was sympathetic to the economic ideas of J.M. Keynes.

From the late 1880s to the mid-1890s (the second decade of the Meiji period), Japan's economic studies increasingly moved away from English liberal economics towards the German Historical and Social Policy School. This new historical and ethical thinking and the adoption of German financial science in Japan first came about through the 1880 English translation of *Guida allo Studio dell' Economia Politica* (1876) by Luigi Cossa (1831–96, Italian historical economist), and the books by R.T. Ely (1854–1943, American historical economist and a founder of the American Economic Association). Economic discourse by H.C. Carey (1793–1879) and the English translation of *Das nationale System der politischen ökonomie* (1841) by Friedlich List (1789–1846) were propagated through the Japanese National Economics Association (Kokka Keizai Kai, established in 1890), and appealed to those concerned with national independence and the protection of infant industries.

The Meiji governments promoted a developmental state policy that followed the Prussian model of rapid modernization and industrialization; but this caused social problems. The (Tokyo) Imperial University (so called after the Imperial University Act of 1886) became the centre for the dissemination of German ideas in Japan, largely through the *Kokka Gakkai Zasshi* [Journal for State Science], which was founded in 1887. In 1888, Kenzo Wadagaki (1860–1919), who succeeded Ernest Fenollosa, the first professor of economics in Japan, wrote a pioneering article titled 'Kodan Shakaito' [The Socialist Party of the Chair]. Noboru Kanai (1865–1933) was instrumental in implanting the German Historical School in Japan and in establishing its theories and policies. Marshall and Mill were still studied, however, at private universities, and Hitotsubashi. T. Inoue (at Waseda) translated Marshall's *Elements of the Economics of Industry* (1896) into Japanese; this soon became a best seller and in 1902 went into its 11th edition.

The Japanese Association for the Study of Social Policy was set up in 1896 to investigate factory laws abroad. Faced with domestic labour problems, the Association, which was opposed to laissez-faire liberalism and to socialism, aimed to prevent class conflict and to sustain social and industrial peace by means of economic freedom and state intervention. Its thinking reflected the pre-Meiji tradition of 'administering the nation and relieving the sufferings of the people', and it considered that economics was interwoven with moral and political issues and embodied the duty of the government to be concerned for the social welfare of its subjects. The Association organised an annual conference and discussed not only labour, but also tariff problems, small industries, the peasantry, and other issues. Iwasaburo Takano (1871–1949), a core member of the Association who studied with Georg von Mayr, founded a strong tradition of social statistics in Japan and later directed the Ohara Institute for Social Research (which had been founded by a cotton giant in 1918), which the Marxists expelled from Tokyo University were to make into a centre for Marxian studies before the Second World War.

In 1906, following the Russo-Japanese war, the *Kokumin Keizai Zasshi* [Journal of National Political Economy], co-edited by the staff of the Higher Commercial Schools at Hitotsubashi and Kobe, first appeared. This became Japan's first proper economics journal and a de facto organ of the Association. While Kanai and his followers at Tokyo Imperial University moved towards

Adolph Wagner's style of state socialism, Tokuzo Fukuda (1874–1930) at Hitotsubashi and his followers at the Higher Commercial Schools were sympathetic to 'reform liberalism' and were closer to the ideas of British political economists. In the Higher Commercial Schools business economics, industrial studies (particularly in small-scale industries) and financial and monetary studies were also well developed. Such a monetary economics tradition made a good basis for the introduction of Keynesian economics into Japan. Keynes's *Treatise on Money* was translated into Japanese in 1932–4, and the 'fever' of the *General Theory* took hold at Hitotsubashi soon after the book's publication, giving rise to the formation of a group of Keynesian economists.

Teijiro Ueda (1879–1940) studied 'business policy' in England with W.J. Ashley, and in 1909, on his return to Japan, he began to lecture on business administration. Highly impressed by Ashley's 'The Enlargement of Economics' (1908) and his proposal for making 'business economics', Ueda wrote about and tried to create a business economics aimed at high efficiency rather than high profit, and a science of socially efficient management similar to that established by German business economists such as H. Nicklish. He subsequently lectured on joint stock companies, social reconstruction and the role of managers, stressing 'the duties of managers'. Ueda published *Shakai Kaizo to Kigyo* [Social Reconstruction and Business Enterprise] (1921), *Shinjiyushugi* [New Liberalism] (1927), and others, issuing his own journal titled *Kigyo to Shakai* [Business Enterprise and the Society]. He actively pursued free trade, and was opposed to socialism, protectionism and the imperialist economic blockade in the 1930s.

In the 1920s, while Marxist studies flourished in academic circles in Japan, particularly at the imperial universities, business economics and management studies also prospered against the background of the rapid development of the corporate economy after the First World War. Ueda's business studies were followed and developed by Y. Masuji at Tokyo and Y. Hirai at Kobe, while F. Muramoto, the first Japanese MBA from Harvard, began to lecture on scientific management at Osaka Higher Commercial School in the very early 1920s. Ashley's pioneering efforts in creating the study of business economics, which were not followed up in Britain, developed at the expanding Higher Commercial Schools and the universities of commerce in Japan. In 1926, the year Ashley's *Business Economics* was published, the Japanese Society of Business Administration was founded, its original membership numbering 342. Before the Second World War, the Higher Commercial Schools and the universities of commerce played a significant role in the development of economics and business studies. Until Marxian economics became dominant in the 1920s, economics in Japan was very much in a tradition of the German Historical and Social Policy School in broad sense. Japanese economists caught up with many developments very early on, and were innovators as well as consumers of foreign ideas, though they did not develop systematically or perceive the whole economy as a single system.

Fukuda, Kawakami and the Marxian Tradition

During the years of the Taisho democracy movement, the Russian Revolution, and rice riots after the First World War, Marxism emerged and began to flourish among Japanese intellectuals, quickly replacing the Historical School. The establishment of economics faculties at the imperial universities in Tokyo and Kyoto and the inauguration of Tokyo University of Commerce took place at about the same time. Initially, Hajime Kawakami (1879–1946) at Kyoto and Fukuda were the leading figures in the study of Marxian economics, whereas Fukuda pioneered the study of welfare economics and the welfare state against Marxism. The newly created economics faculty at Tokyo produced and was dominated by a number of eminent Marxian economists, such as Hyoe Ouchi, Moritaro Yamada, Hiromi Arisawa and Kozo Uno. Many young scholars went to study in Germany.

While Fukuda and Kawakami were initially heavily influenced by the German Historical School, they began to develop original

perspectives by assimilating various new trends in economics. Fukuda had been inspired by Roscher and Marshall since his student days, and in Germany studied with Brentano, with whom he co-authored *Rodo Keizairon* [Labour Economics] (Brentano and Fukuda 1899), discussing working conditions, productivity and the working people's welfare. Fukuda's economic studies covered a wide range of subjects, the most important of which were probably welfare economics and social policy. Though he studied the orthodox welfare economics of Marshall and Pigou, it was from J.A. Hobson that Fukuda learned most about the ethical and humanist approach to welfare economics. Just like the American Institutionalists, Fukuda became openly sympathetic to the idealist, historical and ethical approach of the Oxford economists (or 'London School Institutionalists'), rather than to the so-called neoclassical Cambridge School of utilitarian economists.

Fukuda contended for social policy (or welfare economic studies) as an alternative to Marxism, and proposed a welfare struggle, not a class struggle. Inspired by Lorenz von Stein and Anton Menger, Fukuda developed the theory of social rights, particularly the right to live (needs), and made it the foundation of social welfare policy. This was similar to the Webbs's 'national minimum'. The art of economics would be to provide the economic basis for the minimum human life and to make cultural and moral development possible, as Fukuda learnt from his contemporaries such as A. Marshall and C.J. Fuchs. These ideas lay at the root of Fukuda's welfare economic studies, and formed the basis for the welfare state, as evaluated by people like Yuzo Yamada (1902–1996), who followed and developed Fukuda's ideas in the theory of economic planning and national income, and Ichiro Nakayama (1898–1980), who applied and extended Fukuda's ideas after the Second World War, stabilising industrial relations in order to increase productivity and proposing the doubling of wages, which formed the basis of the income-doubling policy in the high-speed economic growth of the 1960s.

The transition to Marxism and political activism in the 1920s is well illustrated in the career of Kawakami. Initially idealistic and much concerned with problems of morality, rather like Noboru Kanai, Kawakami was deeply disturbed by the poverty that he encountered in the slums of London (see his best-selling book *Binbo Monogatari* [A Tale of Poverty], 1917). He argued that production in the capitalist system was designed not to fulfil human needs: the basic needs of the poor were ignored because they were not expressed in term of monetary demand, which led to over-consumption by the rich. Kawakami linked modern economic analysis to the moral precepts of Tokugawa philosophers such as Banzan Kumazawa, whose 'frugality' of the rich and proposals for the nationalisation of industry and state-run welfare schemes reflected a late-Tokugawa agriculturalist Nobuhiro Sato's egalitarian nationalism. For Kawakami, the ultimate object of economics was to make human beings more fully human. Despite its wide popular appeal, *A Tale of Poverty* was criticised by younger scholars, such as his former student Tamizo Kushida (1885–1934), whose debates were to play a vital role in developing Marxian economics among the younger generation.

Marxist ideas have had their greatest impact on the peripheral nations of the capitalist world such as Russia. Japan was a latecomer in the industrialised world and had large agrarian sectors in the pre-war period in which the pre-capitalist remnants were slowly disappearing. Marxist economic thought became entangled in questions of political strategy and generated a debate over the possibility of 'premature' revolution within a semi-developed capitalist society. The Koza (Lecture) School, named after the *Nihon Shihonshugi Hattatsushi Koza* [Lectures on the Historical Development of Japanese Capitalism] (1932–33), defined as its objectives the bourgeois democratic reforms that must precede a future socialist revolution. Moritaro Yamada (1897–1980) was influential in developing the distinctive Koza School approach. This was criticised by the Rono (Worker–Farmer) School, which had separated from the Communist Party and aimed to create a mass organization of workers, peasants and others that would evolve into a revolutionary movement to overthrow capitalism.

The influence of Marxism on Japanese intellectual life reached a high point in the decades after the Second World War. During the Allied occupation, many of those who had played prominent parts in Marxist debates and who had been expelled from their chairs re-emerged as dominant figures in the economics faculties of universities. Yamada suggested that the Allies' occupational reforms had brought about Japan's long-delayed bourgeois democratic revolution, and he sat on the Land Reform Committee for creating the landed farmers and democratising the farmland system. The Otsuka School of economic history, which emerged from the Koza School and was led by Hisao Otsuka (1907–96), and the Civil Society School led by followers of Adam Smith studies like Zenya Takashima (1904–90) and Yoshihiko Uchida (1913–89), also played an important role in the post-war modernization and democratisation of Japan. Adam Smith studies constituted a strong tradition in the development of Japan's economic thought.

The years immediately after 1945 were marked by the active participation of economists in policymaking, and 'Marxian' economists made a disproportionate contribution. Among them were Hyoe Ouchi (1888–1980) and Hiromi Arisawa (1896–1988), who, together with Ichiro Nakayama and Seiichi Tobata, were important members of a research committee of the Foreign Ministry that published *Nihon Keizai Saiken no Kihon Mondai* [The Basic Problems of Reconstructing the Japan's Economy] (1946), stressing democratisation and advocating the importance of government planning and intervention for the recovery of the Japan's economy. Arisawa, who had stressed the concept of socialisation since his studies in Weimar Germany in the mid-1920s, in 1946 proposed to the Cabinet the priority of producing coal and steel, based on the Austrian idea of roundabout production and Marx's two-sector production model. He had developed his ideas of a managed economy and also generated a theory of 'dual structure', namely, the coexistence of large-scale and small-scale industries; the gap between them was a structural problem that was also the problem of employment and wage structure. Such a structural gap was also seen between the modern industrial sector and the pre-modern agricultural sector, which had a large underemployed labour force. The theory of dual structure was developed into a theory of wages differentials and value-added differentials across industries based on empirical and statistical studies by Miyohei Shinohara (born 1919) in the high-speed economic growth era from around 1960. Shinohara, who 'formed his analytical framework, taking in Keynes, Hayek, Marx, properly revised, and making the reality as the last resort' (Shinohara 1987, vol. 4, p. 395), had studied Nakayama's economics and Kaname Akamatsu's synthetic dialectics and soon worked with Kazushi Ohkawa (1908–93) and the Hitotsubashi group of the Institute of Economic Research on *Choki Keizai Tokei* [Long-Term Economic Statistics in Japan] (14 volumes, 1965–88), which was inspired by Yuzo Yamada's *Nihon Kokuminshotoku Suikei Shiryo* [A Comprehensive Survey of Japan's National Income Data] (1951). Along with these studies on national income statistics, advances were made in empirical, quantitative and theoretical studies on the Japanese economy.

The Spread of Neoclassical Economics

Fukuda was the economist most responsible for introducing many of the latest economic trends into Japan. He advised his students to translate *Das Kapital* almost in parallel with Marshall's *Principles*, whose full translation came out in 1926. In the late 1920s he created a system of parallel lectures in economics, that is, Marxian and modern (neoclassical) economics, a system that was retained at most Japanese universities until the 1980s. From about 1930 international journals were another important source for the spread of neoclassical economics in Japan. Some Japanese economists were regular readers of *Zeitschrift für Nationalökonomie* (1930–), *Econometrica* (1933–), and the *Review of Economic Studies* (1933–). In 1934, the Japanese Economic Association was established by leading theoretical economists, and in 1997 the Association was re-founded, its tradition thus maintained and even expanded.

General equilibrium theory was introduced through four channels in the 1920s. First, from 1921 to 1922 Fukuda advised his student Nakayama to study Cournot, Walras and Gossen, the classics of mathematical economics. Second, Alfred Amonn (1883–1962), a Czech who had studied at the University of Vienna, explained Cassel's simplified system of general equilibrium in classes at the Imperial University of Tokyo between 1926 and 1929. Third, J.A. Schumpeter, admirer of the general equilibrium theory, had some influence on Japanese economists in the 1920s and 1930s. Two Japanese economists, Tobata and Nakayama, who later became influential in Japan, had studied under him in Bonn. Schumpeter's *Das Wesen und der Hauptinhalt der theoretischen National-ökonomie* [Essence and Main Content of Economics] (1908) was translated into Japanese: there is no English edition. Schumpeter advised two other young economic theorists, Miyoji Hayakawa (1895–1962) and Takuma Yasui (1909–95), to begin with Walras. Fourth, Cassel's system was also taught by Yasuma Takata (1883–1972) at Kyoto Imperial University after 1929. Thus general equilibrium theory circulated in Japan a little earlier than in the English-speaking world.

In 1929, Takata began to publish his *Keizaigaku Shinko* [New Lectures in Economics] (1929–32). This constituted a survey of what was happening in economics, including a discussion of both general equilibrium theory and partial equilibrium theory. Succeeding Fukuda, Nakayama lectured in neoclassical economics and statistics at Hitotsubashi, and his textbook *Junsui Keizaigaku* [Pure Economics] (1933), contributed to the popularising of general equilibrium theory and the basic concepts of neoclassical economics in Japan. He explained the methodology of pure economics or general equilibrium theory, then the theory of economic development, following the Schumpeterian path. Nakayama further tried to take in Keynes's theory of the investment multiplier as an analytical means to connect dynamic and static aspects of economy in his *Hatten Katei no Kinko Bunseki* [Equilibrium Analysis of the Developing Process] (1939).

Some good statistical studies were made relating to rice. Yoshinosuke Yagi (1895–1944) conducted a full-scale statistical study of rice by surveying current studies. He confirmed that King's Law or the law of demand existed in the case of rice, and showed that Engel's law also held true. Yagi calculated not only the demand elasticity of rice with respect to the price, but also constructed the price and quantity indices following W.M. Persons's method. Excellent econometric studies were carried out in the 1930s as an application of Marshallian economics. Eiichi Sugimoto (1901–52), who studied under Fukuda and taught Marxian economics at Hitotsubashi, was very Marshallian and stressed partial equilibrium, time elements and elasticity, and criticised pure economics. In his *Beikoku Juyo-hosoku no Kenkyu* [Study on the Law of Demand for Rice] (1935), Sugimoto regarded per capita consumption of rice as the demand for rice following the cobweb theorem that the points on the demand curve were realised in the case of disequilibrium. Following H.L. Moore's extension of Marshallian demand analysis (1929), Sugimoto included not only the price of rice but also the prices of all other commodities and time as variables in the rice demand function. He judged that the effects of the changes in the prices of non-rice commodities on the demand for rice should cancel each other out because there were neither close substitutes nor complimentary goods for rice. He divided the rice price index by the general price index and got the rice rate to remove the effect of the changes in the other prices on the rice price. Then he estimated the demand function for every seven years using the least squares method. These early econometric works prompted the study of neoclassical theory of demand and supply.

In 1930 Kei Shibata (1902–86) at Kyoto examined Cassel's 'mechanism of price formation' (Shibata, 1930) and explained one of the formal problems in Cassel's simplified system of general equilibrium three years earlier than H. von Stackelberg. Shibata created numerical examples and counter-examples, and published a series of theoretical papers in English in *Kyoto University Economic Review*. It is also noteworthy that Shibata's review article (1937) of Keynes's *General Theory* (1936) included Keynes's own comments on the draft and was praised by D. Dillard's

in *The Economics of John Maynard Keynes* (1948), although it was critical of Keynes's macroeconomic analysis for lacking technological changes in production and the transmission mechanism from the increase in savings to the increase in investment.

Takuma Yasui (1909–95) can be called the Japanese Samuelson. He attended Amonn's lectures at Tokyo and studied the work of Nakayama and Takata. He began to publish a series of papers on the Walrasian general equilibrium framework in 1933. In his article 'Juyo no hosoku nitsuite' [On the law of demand], Yasui (1940) developed a sophisticated analysis of consumer behaviour, generating the law of demand along the lines of Slutsky, Hicks and Allen. He made a step forward in obtaining the universal law of demand and tried to clarify the conditions under which the demand curve is convex or concave. Masazo Sono (1886–1969), a mathematician at Kyoto, discussed the separability of goods in his 'Kakaku hendo ni tomonau bunrikanouzai no jukyu hendo' [Effect of price changes on the demand and supply of separable goods] (1943). By discussing J.R. Hicks's definitions of substitutability and complementarity among commodities, Sono developed the idea of the separability of commodities in terms of utility. The English version of Sono's paper, which appeared in the *International Economic Review* in 1961, anticipated similar studies published later in English.

The Study of General Equilibrium Theory

It is well known that a number of Japanese economists began to contribute to the study of mathematical economics around 1950. In retrospect, this happened earlier: from around 1930 onwards Japanese mathematicians spread contemporary mathematical knowledge by producing new textbooks in Japanese. In the 1940s several Japanese economists made important contributions to stability analysis, mostly in Japanese but comparable to the studies developed in North America and Europe in the 1950s. The economists Takuma Yasui, Hideo Aoyama (1910–92) and Michio Morishima (1923–2004) and the mathematician Masazo Sono studied stability analysis and the problem of the market mechanism and economic dynamics, discussing not only the mathematical implications of the economic models but also the economic meanings of the mathematical models. By 1950, Yasui and Morishima had studied the conditions for the stability of a competitive equilibrium with the use of a system of ordinary differential equations and reached the qualitative theory of stability developed by A.M. Liapunov, who was gaining popularity outside Russia but was as yet little known to Western economists. As a result of this research, Takashi Negishi wrote his famous and influential article 'Stability of a competitive economy: a survey article' (1962), which provided a good survey of stability analysis.

At Kyoto Hideo Aoyama studied the dynamics of economic exchange. His article 'Mirudaru no keizai hendo riron' [Myrdal's theory of economic fluctuation] (1938b) started with the cumulative processes of inflation and deflation, which were articulated in Wicksell's monetary economics. He elaborated D.H. Robertson's step-by-step analysis and the period analysis by Myrdal, Lindahl and Ohlin. Aoyama also traced differential-difference models, which were set out by R. Frisch, H. Holme and M. Kalecki. Aoyama later published the English version 'A Critical Note on D.H. Robertson's Theory of Savings and Investment' (1940).

In his 'Seigakuteki ippankinkoron to dogakuka no mondai' [Static theory of general equilibrium and its dynamization] (1938a) Aoyama picked on the concept of momentary dynamic equilibrium in Frisch's 'Statikk og dynamikk' [Statics and dynamics] (1929) and discussed a sequence of momentary equilibrium that was established in a Walrasian exchange economy with multiple commodities. In his 'Gendai keiki riron niokeru hanro hosoku no mondai' [On the law of market in the contemporary theories of business cycles] (1942) he examined the concept of general dynamic economic equilibrium and pointed out that Hicks's 'temporary equilibrium' was the same notion as Frisch's 'momentary dynamic equilibrium' and La Volpe's 'general dynamic economic equilibrium'.

In the 1950s, the proof of the existence of a general competitive equilibrium utilised set

theory and convex set method, and a fixed-point theory. Around 1954, Hukukane Nikaido (1923–2001) in Tokyo made a special study of the existence question independently of K.J. Arrow and G. Debreu's 'Existence of an equilibrium for a competitive economy' (1954). Nikaido's 'On the classical multilateral exchange problem' was published in *Metroeconomica* of 1956. Nikaido formulated the basic propositions of the existence of general equilibrium as a theorem relating to the excess demand correspondence in the case of multilateral exchange of many commodities. Resorting to slightly more restricted assumptions than Arrow and Debreu, Nikaido proved this with the direct use of Kakutani's fixed-point theorem.

Hirofumi Uzawa (born 1928) proved in his 'Walras's existence theorem and Brouwer's fixed-point theorem' (1962) that the two theorems in the title were equivalent. He noted that it had already been well established that Brouwer's fixed-point theorem implies Walras's existence theorem. He constructed an excess demand function, which satisfied the conditions describing Walras's existence theorem. By dividing a price by the summation of prices, Uzawa neatly proved that Walras's existence theorem implies Brouwer's fixed-point theorem. Though he was at Stanford University, the paper appeared in *Kikan Riron Keizaigaku* [Economic Studies Quarterly], which was the formal journal of the Japanese Association of Theoretical Economics and the Japanese Econometric Society (now the *Japanese Economic Review*, published by the Japanese Economic Association).

In the 1950s, Japanese economists such as Nikaido, Uzawa, Kenichi Inada (1925–2002), Hajime Oniki (born 1933) and Takashi Negishi (born 1933) joined K.J. Arrow's project at Stanford backed by the Office of Naval Research. They played active roles in the study of the existence and stability of a general equilibrium in a competitive economy, two-sector growth models and welfare economics. The mathematical economist David Gale visited Japan, stayed at Osaka University and studied with Nikaido, Shin-ichi Ichimura (born 1925) and Morishima in the mid-1950s. The Japanese dream of intellectual cooperation with Western economists finally became a reality.

Moreover, the generous provisions of the fund for the Government and Relief in Occupied Areas (GARIOA) and, later, the Fulbright scholarship programme brought Japanese youth to the United States and to other countries for advanced study. Ichimura, Tsunehiko Watanabe (born 1926), Tadao Uchida (1923–86), and Ryutaro Komiya (born 1928) were fascinated by American empirical studies, such as the inter-industry analysis originated by Leontief and econometric modelling by Chenery. Returning to Japan, they not only taught American economics but also conducted important econometric works in making economic plans and predictions in the 1960s. Hiroshi Furuya (1920–57), who studied at Harvard from 1952 to 1954, not only strongly advised economics students to study mathematics, but also invited mathematics students such as Hirofumi Uzawa and Ken-ichi Inada to study economics. Moreover, Morishima studied at Oxford and enjoyed attending the meetings organised by J.R. Hicks in 1954 and 1955.

Trade and Development

In international economics and economic policy, Japanese economists emphasised different factors from those emphasised by economists in other countries. For example, the Japanese economists who took an interest in policy issues between the 1930s and the 1970s were most interested in the relationship between economic development and international trade. While they shared interests in shifting comparative advantage, dynamic internal economies, and the protection of infant industries, we can usefully divide them in two groups by considering to their backgrounds.

First, some Japanese economists had strong connections with the German-speaking community of economists. Kaname Akamatsu (1896–1974) became known to non-Japanese audiences thanks to his flying-geese-pattern theory (Ganko Keitai Ron) after his paper in English 'A theory of unbalanced growth in the world economy' (1961) was published in *Weltwirtshaftliches Archiv*. Akamatsu

invented the theory in the 1930s, based on his empirical studies of Japan's woollen industry and later applied it to industries related to cotton yarn, cotton cloth, spinning, weaving machinery and general machinery industries between 1870 and 1940. In the mid-1920s, having spent almost two years in Heidelberg, he garnered ideas about how to do empirical work (business barometers and case study method) during a short stay at the Harvard Business School.

Akamatsu drew three time-series curves denoting the import, the domestic production, and the export of manufactured goods in a plane with time on horizontal axis and the yen value on the vertical axis. He realised that the import curve usually increases until it reaches a peak and declines with the increase of domestic production, at which time the exports increase. This means that many import curves had a mountain-shape with one peak. This pattern might appear to be similar to that suggested in a Hecksher–Ohlin trade model with many goods. As capital accumulates, there is shifting comparative advantage over time. Originally it was described as the 'flying-geese-pattern' theory of industrial development, or the 'catching-up product cycle' theory of development, as phrased more accurately in English. Akamatsu believed that his findings for Japan could be generalised into a theory for many countries, especially developing countries or late developers. His development theory has been applied to a picturesque description of a group of developing countries and has led to the discussion of which country is the front flyer.

Hiroshi Kitamura (1909–2002) was, like Akamatsu, critical of the Ricardian theory of free trade and the international division of labour. He left Japan for Europe in 1931, studied economics at the University of Berlin, and specialised in international economics and foreign investment at the University of Basel. In 1941 he published *Zur Theorie des internationalen Handels: Ein kritischer Beitrag* [On the Theory of International Trade: A Critical Contribution]. He developed an early macro-dynamic theory, which was considered to be more appropriate for developing countries than advanced countries, and he supplied theoretical support for protectionist policy such as that advocated by Friedrich List. He brought the theory of trade and development from the German-speaking world back to Japan in 1948 and then he was sent to the United Nations Economic Commission for Asia and the Far East from 1957 to 1969.

Other Japanese economists had close connections with English-speaking economists like Murray C. Kemp. For example, Kemp collaborated with Takashi Negishi, Michihiro Oyama (born 1938), Kouji Shimomura (1952–2007), and Masayuki Okawa (born 1953), and Inada, Uzawa, and Yasuo Uekawa (1925–94) visited the University of New South Wales. Uekawa edited the Japanese version (1981) of Kemp's *Pure Theory of International Trade and Investment* (1969). Kemp's books referred to a number of Japanese works, some of which had been published in international economics journals, others in Japanese university journals or as mimeos.

Among them, Negishi (1972) was interested in the possibility of the protection of an infant industry and debated with Max Corden. Corden and Kemp were critical of the so-called Mill–Bastable case for protecting infant industries, and in response Negishi argued for the protection of the infant industry with emphasis on dynamic internal economies. He maintained that if Bastable's test is understood in terms of increases in social welfare in some sense, then it by no means requires private profitability, and so Kemp's test is not necessary (though it is sufficient) for protection.

The Social Activities of Japanese Economists

The first task for Japanese economists after 1945 was to hasten the recovery of the nation's ruined economy. Japan's top economists joined the Economic Stabilization Board, which was organised on the instruction of the Supreme Commander of the Allied Powers (SCAP) and later reorganised into the Economic Planning Agency. Shigeto Tsuru (1912–2006) joined the Board after he returned from Harvard, where he was trained both in Marxian and neoclassical economics. He brought not only a cosmopolitan attitude but also

American economic language into the community of Japanese economists. Tsuru and Saburo Okita (1914–93) co-authored the famous first White Paper on the Japanese economy in 1947, where Tsuru's training as an economist with pragmatic inclinations was vividly revealed. Okita and other officials were trained as economists through working for the Board. Okita was sent to the Economic Commission for the Asia and the Far East (ECAFE), and he was the chief economic analyst for the Commission in 1952–3. For many years he represented 'the able Japanese bureaucracy'.

Japan returned to the international community on the basis of the Peace Treaty of 1952, which marked the end of 15 years of central control over the Japanese economy. Governmental agencies such as the Ministry of International Trade and Industry (MITI), the Ministry of Finance (MOF), and the Ministry of Agriculture and Forestry (MAF) began to regulate the economy. For example, the power industry was run by the government from 1939, but in 1951 nine private companies took their businesses back with the slogan of 'democratization' or participation. They used a neoclassical-econometric analysis to make a report for MITI on the necessary increase in installed capital, based on estimates of economic growth and the increasing demand for electricity. Neoclassical and Keynesian economists began to collaborate with MITI to rationalise the power industry more thoroughly in 1954. MITI, MOF and MAF made input–output tables of the Japanese economy independently of each other in 1951, which were completed respectively by 1956. They believed that the tables were useful in regulating the economy and in mediating between consumers and producers when Japan began to take growth-oriented policies. The MITI project was the biggest project undertaken, and was led by Shin-ichi Ichimura, who was trained at MIT. In the process of constructing the tables, the quality of the statistical data for national income and wealth was greatly improved. The agencies decided to cooperate with each other beyond bureaucratic sectionalism to make a single 1955 input–output table. From about 1960 they asked neoclassical and Keynesian economists to discuss the economic issues in making policies and to teach mainstream economics to government officials in MITI and other ministries.

The first econometric model of the Japanese economy was made by Isamu Yamada (1909–86) in 1948. After 1957, those who had been trained in the United States began to build econometric models one after another. In 1960, the Ikeda Cabinet decided on the Income Doubling Plan, that is, the economic plan of doubling per capita national income in a decade. After 1960 they asked econometricians to prepare the mid-term plan. A variety of macroeconometric models of the Japanese economy were constructed for various purposes, such as long-term economic forecasts, business cycles explained by changes in investment, and the Klein–Goldberger-type model of the Japanese economy. Tadao Uchida (1925–86), Tsunehiko Watanabe (born 1926), Masahiro Tatemoto (born 1925), Kei Mori (1932–90) and Shuntaro Shishido (born 1924) played leading roles in simulating government policies with the use of the latest computer technology.

The Japanese enjoyed a new way of life, equipped with an increasing number of durable consumer goods, which were the fruits of high-speed economic growth. Yet by 1970, when Japan had become one of the advanced countries, several negative external effects were found in the environment, such as mercury poisoning caused by drainage, air pollution and traffic jams in large cities. It was also realised that the welfare system was not sufficiently developed to provide for an enjoyable retirement. Japanese economists studied a number of problems similar to those that had interested American and European economists.

Tsuru, who had been committed to the basic tenets of Marxian political economy since the late 1920s and who had studied under Schumpeter at Harvard, wrote "Kokumin Shotoku' gainen heno Hansei' [Reflections on the 'national income' concept] in 1943, when he was first employed by what later became the Institute of Economic Research (at Hitotsubashi). This was a critique of the market-oriented concept of national income, which would not be a good indicator of welfare. This became his major concern in

subsequent years and led to 'In Place of GNP' (1971) and formed the basis of *Kougai no Seijikeizaigaku* [Political Economy of Environmental Disruption] (1972), by pointing out that environmental pollution was not counted negatively in the system of national accounting. He took the initiative in organising an interdisciplinary Research Committee on Environmental Disruptions in 1963, which was widely supported by economists such as Ken-ichi Miyamoto and Hirofumi Uzawa. Tsuru was involved in a series of international academic activities, culminating in the presidency of the International Economic Association (IEA) from 1977 to 1980.

In terms of international activities, the Econometric Society holds regional meetings in East Asia. The first Far Eastern meeting was held in Tokyo independently of the Society in 1950, although its report appeared in *Econometrica* in 1951. Formal annual meetings were held in Japan from 1966 to 1970. After a long break, biennial meetings have been held every other year somewhere in East Asia since 1987. In July 1997, the fifth meeting was held in Hong Kong, which had been returned to the People's Republic of China a few days earlier. In August 1995, the World Congress of the Econometric Society was held in Tokyo.

After the Turning Point of 1985

The year 1985 was an important turning point for Japanese economists. American economists, including Paul R. Krugman, were the first to become interested in US–Japanese trade frictions and examined Japanese trade and industrial policies. Japanese economists were then forced to pay attention to the results of this research and the trade dispute itself. They felt obliged to make some response even though they had previously ignored criticism by American politicians and officials, and began to think that some applied economists should come out of their ivory towers, arm themselves with relevant facts and ideas, and face American professional economists in a policy debate. However, the East Asian financial crisis of 1997 made them more concerned about the interlinkages of national economies and inclined them to conceive of a kind of transnational community or forum for regional economic stability. Although the idea of establishing an Asian Monetary Fund was rejected by the United States and China in 1997, Japanese economists aim to integrate the Chinese economy into international settings. A good economist today may have to handle Chinese, English and Japanese if he or she wants to be active in Japan.

See Also

- ▶ General Equilibrium
- ▶ Historical School, German
- ▶ Morishima, Michio (1923–2004)
- ▶ Tsuru, Shigeto (1912–2006)
- ▶ Uno, Kozo (1897–1977)

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Japanese Economy

David Flath

Abstract

This is a broad survey of recent academic research on Japan's economy, mostly published in the last ten years, all of it in English. The

research described here spans many fields of economics. The article is intended as a bibliographic aid for economics scholars and students who want to explore the many creative ways that economics is being applied to the study of Japan.

Keywords

Antitrust; Bank capital; Banking crisis; Bequests; Company-specific skills; Distribution of wealth; Evergreening; FDI; Government debt; Government regulation; Japanese economy; Life-cycle saving; Lifetime employment; Monetary policy; Real exchange rate; Ricardian saving; Zero lower bound

JEL Classifications

B2

Introduction

This is a bibliographic article describing recent academic research on Japan's economy. The research is all focused on Japan, but addresses many topics of broad interest to the economics profession and others, such as the causes and consequences of financial shocks, the perverse incentives of undercapitalised banks, the necessity of basing monetary policy on instruments other than interest rates at the zero lower bound and the real effects of monetary-induced exchange rate movements. It also deals with matters more specific to Japan, such as why the employment practices known as lifetime employment and seniority-based wages seem to be more rooted in Japan than elsewhere, and their implications for Japanese workers and their families. Other recent research confirms the applicability of the life-cycle model as an explanation for Japan's private saving, explores the sustainability of Japan's expanding government debt and documents the changing distribution of wealth in Japan. Still other research expands our understanding of the nature and effects of government regulation of industry in Japan, and the behaviour of Japanese firms. This article covers most of the latest work on Japan that uses methods familiar to professional economists. For deeper background and annotated references to earlier work on the same topics, refer to Flath (2014) and the many studies cited there.

Japanese Banks and Macroeconomic Shocks

The worldwide recession following the 2008 collapse of Lehman Brothers has brought new urgency to the study of the causes of financial shocks, their macroeconomic effects and the possible regulatory responses. As detailed by Corbett (2012), this has focused economists' attention on Japan as never before. Parallels between the 2008 Lehman shock in the USA and the 1990s banking crisis in Japan have been widely noted. Both were precipitated by imprudent real estate loans by banks, some of which were channelled through unregulated intermediaries. The proximate cause of the Japanese banking crisis was the sharp drop in asset prices in 1990–91 that left many banks undercapitalised, perhaps even insolvent. A more fundamental cause was the regulatory regime that had allowed imprudent lending to fuel an unsustainable asset price boom in the first place.

The real effects of banking crises stem from constriction of loans by banks with depleted equity. A bank with little equity capital is loath to make new loans because any return on the investment will enrich the bank's creditors (mainly the depositors or the insurer of deposits, i.e. the government) rather than its stockholders, and it is the stockholders who control and manage the bank. Banks with greatly depleted equity stop making new loans, even ones that would have positive expected returns, and at the same time take steps to avoid publicly revealing the loans that are already in default. Measuring these effects is a recent focus of academic research. The seminal articles are Klein et al. (2002) and Peek and Rosengren (2005). In the earlier paper, the authors show that the firms having primary ('main bank') relationships with any major Japanese bank

whose long-term deposit ratings were downgraded by Moody's (a private investment service) became less likely to invest directly in the USA. Based on this evidence, they argue that the sharp decline in Japanese direct investment in the USA from 1990 to 1994 was caused by the depletion of bank equity capital. Furthermore, the decline in Japanese FDI was large enough to have a macroeconomic impact in the USA. This finding is reinforced by Amiti and Weinstein (2011) who show that from 1990 to 2010, Japanese banks with depleted capital constricted trade finance, and that this significantly reduced Japanese exports relative to real GDP. That is, the Japanese banking crisis had a larger adverse effect on exports than on domestic output. But as pointed out by Harada et al. (2011), Japanese banks were largely unaffected by the 2008 Lehman shock, yet Japanese exports still nosedived. The volatility of Japanese exports may have more to do with just-in-time supply chains than with interruptions of trade credit.

On the macroeconomic effects of bank insolvency, a key point to bear in mind is that Japanese banks could continue operating without recapitalising only so long as regulatory authorities allowed them to do so. Many have judged that Japan's regulatory oversight in the 1990s was too lax. Peek and Rosengren (2005) document the general misallocation of bank credit stemming from the perverse incentives of undercapitalised Japanese banks not subject to strict regulatory oversight. A specific example of misallocation is the 'evergreening' of loans by undercapitalised Japanese banks. Rather than frankly acknowledge their losses on loans that had fallen into arrears, the banks connived to proffer still additional loans to the same clients, simply for the purpose of meeting interest payments already due. The point was to preserve the book value of bank capital at a level sufficient to forestall regulatory action. The regulatory authorities need not have allowed this, but they in fact did, and even encouraged it. Peek and Rosengren show that from 1993 to 1999, Japanese firms in financial distress, perversely, were *more* likely than others to obtain new loans from the banks with whom they had main bank relationships, particularly if the reported capital ratio of the bank was close to the regulatory stipulated minimum required for continued operation.

The suggestion is that misallocation of bank loans prolonged Japan's economic stagnation. Caballero et al. (2008) take this suggestion to heart and try to identify the reduced productivity attributable to the perpetuation of 'zombie' firms in each Japanese industry from 1984 to 2002. Here the unpleasant word 'zombie' – meaning a corpse animated by voodoo witchcraft – is their name for a firm only able to continue in operation because of sham bank loan restructuring (evergreening). They argue that by the end of the 1990s, as much as 15% of all nonfinancial business firm assets in Japan resided in these distressed firms. This calculation is made by identifying specific firms for which reported interest payments were clearly below market levels for the amount of bank debt they were carrying. They find that the preponderance of these firms were in services, wholesale and retail trade and real estate, rather than in manufacturing. Industries with more such firms had lower growth in total factor productivity, and the healthy firms in those industries exhibited slower growth in employment.

The evidence just described means that allowing the Japanese banks to continue operating with their equity capital depleted prolonged the macroeconomic stagnation. Barseghyan (2010) reaches the same conclusion using a general equilibrium model calibrated to fit Japan. He finds that the distorted incentives of undercapitalised banks in Japan reduced 1990s output growth by anywhere from 0.2% to 0.9% per year on average. The Japanese government did inject capital in the prominent private banks in March 1998 and again in March 1999. In effect these were public subsidies that carried the possibility of ultimate nationalisation. Perhaps these capital injections were a case of too little, too late. Montgomery and Shimizutani (2009), based on analysis of individual bank panel data, find that the second round of capital injection, which was larger than the first, did simulate banks to write off bad loans and increase domestic lending, particularly to small and medium sized firms. Giannetti and

Simonov (2013) reach a similar conclusion, and also argue that the earlier 1998 round of capital injection was too small to curtail evergreening or stimulate bank lending to healthy firms. Giannetti and Simonov further examine the effects of new equity issues by banks ('private recapitalisation') and find these to have been small and insignificant; the private recapitalisation was not large enough to be effective. The government could have insisted on expanded new share issues as a condition of continued operation and ultimately did just that, but not until 2003.

Monetary Policy at the Zero Lower Bound

The 1990s have been dubbed Japan's 'lost decade'. Real GDP grew an average 3.9% per year in the 1980s but only 1.3% per year in the 1990s, and then only 0.7% per year in the 2000s. The slowing real growth partly reflects the problems with the banks as just related, and also partly reflects the slowing expansion and then shrinking of the Japanese labour force. The Japanese labour force reached a peak of 68 million persons in 1998 and by 2010 had shrunk to 66 million persons. But as imputed by Tyers (2012), the changing size of the labour force had a less than commensurate effect on Japan's real output. Horioka (2006) points to aggregate demand as having mattered a lot in explaining Japan's stagnating real GDP.

Could monetary policy have done more to increase Japan's output and employment? For monetary policy to be effective at stimulating output, it must lower real interest rates, which makes business investment more profitable. As producers rise to meet the expanded demand for final investment goods, they employ otherwise idle resources. A lower real interest rate is the vehicle through which monetary policy is presumed to have these effects. But when nominal interest rates become zero or near zero, as happened in Japan in 1999 and in the USA in 2008, the only way for a central bank to significantly reduce real interest rates is by causing an increase in the expected rate of inflation. Because expectations of inflation are, often, extrapolations from the recent past, raising the expected inflation rate requires the central bank to actually cause inflation. A central bank could do this by expanding the money supply, but that has turned out to be more difficult at the zero lower bound than many economists had thought. To be very clear, the difficulties in expanding the money supply at the zero lower bound are inherently political, not technical.

In the standard view – contested by Werner, about which more shortly – the operating instrument of the Bank of Japan (BoJ) in setting monetary policy had been the call rate, the interest rate on very short-term loans in the interbank money market, analogue of the US federal funds rate. By supplying funds in the call market, the BoJ would lower the call rate and induce banks to borrow more and themselves make more loans and expand the money supply. But in March 1999 the BoJ had lowered the call rate to zero. From that point, to further expand the rate of growth of the money supply would require the BoJ to do something besides just supplying funds in the call market as it had mainly been doing. For example, the BoJ could purchase long-term securities or fund Japanese government purchase of US government bonds or other foreign exchange. It was reluctant to do any of these things and instead experimented with alternatives: directly expanding bank reserves (quantitative easing), announcing soft inflation targets and attempting to jawbone the banks into expanding their loans. Woodford (2012) sifts through the evidence and demonstrates that none of this had any significant effect on money growth or on inflationary expectations. A paper by Ueda (2012), an academic economist who was on the Bank of Japan policy board during these years (1998–2004), reaches the same pessimistic conclusion.

For a central bank to expand the money supply when its target interest rate reaches the zero lower bound requires politically difficult measures, such as adopting new operating procedures, purchasing a wider range of assets in huge amounts or cooperating with the executive branch of government in the purchase of foreign exchange or in accommodating fiscal spending. For example, Svensson (2003) proposed a 'foolproof way' to

escape from a liquidity trap and end deflation. Details aside, it amounts to central bank funding of the purchase of foreign exchange to expand the money supply, depreciate the home currency and stimulate net exports (a component of aggregate spending). As Svensson points out in the same paper, any policy that increases the expected rate of inflation with interest rates at the lower bound is likely to depreciate the currency. This is implied by arbitrage that maintains covered interest parity in the foreign exchange market when real rates of interest in the home country fall relative to the rest of the world. Interestingly, since the advent of the much-heralded shift in Bank of Japan policy induced by Prime Minister Abe in early 2013, the yen has depreciated dramatically.

Hausman and Wieland (2014) offer a favourable early assessment of 'Abe-nomics'. Abe Shinzo, leader of Japan's Liberal Democratic Party, became prime minister in December 2012 after having campaigned on a pledge to force the Bank of Japan to expand the money supply. He appointed like-minded people to the policy board, led by the new Bank of Japan governor Kuroda Haruhiko, who quickly announced a 2% inflation target, to be achieved within two years by massive purchases of financial securities. In 2013 the yen fell 21% against the US dollar, the Nikkei stock index rose 57%, the expected inflation rate of professional forecasters rose by 1–1.4% and the money supply expanded.

The political difficulty in conducting an effective monetary policy at the zero lower bound is sufficiently troublesome that avoiding the lower bound should be one of the goals of a central bank, and should influence its judgment in determining an acceptable inflation rate in normal times. Fuchi et al. (2008) make this logic explicit in a dynamic stochastic general equilibrium model calibrated to fit Japan. They find that the optimal inflation target for Japan is between 0.5% and 2% per year, which was also the stated inflation target of the Bank of Japan at the time of their writing (the authors were affiliated with the BoJ). Leigh (2010) estimates a structural model of the Japanese macroeconomy 1981–95 with a monetary policy Taylor rule that presumes the BoJ was setting a 2% steady-state inflation target. He uses the estimated model to simulate the effect of alternative monetary policy regimes and finds that the BoJ raising its inflation target to 4% would have added little to output. A more aggressive response to the GDP gap by the BoJ was also needed, if a lost decade was to have been averted. Tyers and Corbett (2012) discuss further recent examples of the use of empirical models in macroeconomic analysis of Japan. This continues to be a fruitful area of research.

The literature described thus far represents the views of neoclassical economists exclusively. At the suggestion of an anonymous referee, an opposing viewpoint may also be noted. Werner (2002) and Voutsinas and Werner (2011) argue that the BoJ instrument of monetary policy before 1992, the onset of the lost decade, was not the interbank interest rate (the call rate). Rather it was BoJ management of the lending by private banks. In its window guidance, the BoJ set specific quarterly lending quotas for each commercial bank. In the Werner view, the asset price bubble of the late 1980s was thus mandated by expanded lending quotas, and the subsequent crash was caused by constriction of those same quotas. Expansion and then constriction of the money supply was not the cause of the bubble and its collapse. Rather, the adjustment in BoJ-mandated lending by banks was the cause both of the bubble and its collapse, and of the changes in the money supply, claims Werner. Possibly counter to this claim, Rhodes and Yoshinio (1999) find that BoJ lending guidance was a more accurate correlate of economy-wide lending before 1982 than after. To end the 1990s crisis, very early on, Werner (1995) advocated a reintroduction of direct BoJ controls of bank credit, and a mandating by the BoJ of expanded loans by each bank, which he dubbed 'quantitative easing'. Werner was the first to coin the phrase, and its meaning has since evolved beyond his initial precise meaning. He continues to advocate 'enhanced debt management' by central banks, including the BoJ (Werner 2014). In elaborating the case for this, he argues that the money banks create in the process of extending loans will stimulate aggregate demand (nominal GDP) only if the loans are to finance purchases of newly produced goods and services. If, instead,

bank loans are used to finance the purchase of financial and other assets, they will merely promote speculative price bubbles in securities and real estate markets. There is in this an echo of the 'real bills doctrine' (a distinctly heterodox view among neoclassical economists), Werner's claim being that mere expansion of the money supply is not sufficient to induce an increase in nominal GDP (as in the quantity theory of money). That is, to increase nominal GDP, expansion of the money supply must be unaccompanied by the private purchase of securities and other such claims ('real bills'?). Werner calls his framework the 'quantity theory of credit'. Readers who want more in this vein may consult Werner's popular book *Princes of the Yen*, published in 2003, a bestseller in Japan. The remainder of this article returns to the work of neoclassical economists.

Exchange Rates and Trade Balances

Economists have long wondered whether monetary policy can significantly influence real exchange rates and trade balances. Hamada and Okada (2009) argue that it can, and that Japan's monetary policy after 1985 was overly attentive to the yen–dollar exchange rate and the trade balance. They claim that, bowing to US pressure, culminating with the September 1985 Plaza Accord, the BoJ caused the yen to appreciate relative to the dollar and stay there, and this wrought two decades of constricted output and deflation. McKinnon (2006) argues that US pressure on China to revalue its currency (the renminbi) relative to the dollar, to soften the push for trade protection within the US, would pull China into the same trap that caught Japan.

Behind these arguments is a presumption that monetary-induced exchange rate movements have real effects that persist. A vast, inconclusive literature explores whether that is indeed the case. In a recent contribution to that literature, Rafiq (2013) estimates a three-equation vector-autoregression model with time-varying parameters (TVP-VAR model), relating the real exchange rate to monetary and fiscal shocks and supply shocks, and relating the trade balance to real output and the real exchange rate. He estimates this model for East Asian economies, including Japan, using quarterly data from 1981 to 2011. The basic strategy is to impose constraints on the long-run multipliers – the constraints are that monetary and fiscal shocks have no long-run effect on output, and monetary shocks have no long-run effect on the real exchange rate – and to capture short-run dynamics through time-varying parameters that allow evolution in the way that monetary, fiscal and real shocks are propagated. Rafiq's main result for Japan is that monetary shocks have had only a transitory impact on the real exchange rate, but a persistent effect on the trade balance. He speculates that this might reflect hysteresis or beachhead effects. That is, Japan's foreign trade entails investments with sunk costs, so it responds sluggishly to price movements. This connects to another focus of the literature, the effect of exchange rates on FDI flows.

Takagi and Shi (2011) find that Japanese FDI flows into other Asian economies, from 1987 to 2008, declined with real depreciation of the yen relative to host country currencies, and increased with exchange rate volatility. They also find that the FDI flows from Japan were smaller when relatively large yen depreciation shocks were more prevalent, perhaps because of some effect operating through expected future movement in exchange rates. Japanese FDI itself – both inward and outward – is a topic ripe for further study. Among the longstanding questions that has never been completely answered is why Japan's stock of inward FDI is so small, uncharacteristic of any other developed country. Waldenberger (2008) is among the latest to suggest that the prevalence of lifetime employment in Japan makes it particularly difficult for foreign firms to set up affiliates there and staff them with able mid-career managers.

Employment Practices

The employment practices known as lifetime employment and seniority-based wages pertain to the regular employees of Japan's large firms, not the part-time or temporary employees of those

same firms, nor the employees of small firms. Recent work has set out to precisely document these practices and explore the political, regulatory and cultural factors that have rooted them in Japan, more than elsewhere.

Ono (2010) carefully examines which Japanese workers appear to have informal contracts conferring lifetime employment. These might be workers who in fact work for the same employer from the end of formal education until retirement, or might be workers who are regular employees, not part-time, temporary or contract workers. As Ono documents, in Japan, either definition pertains to the same 20% of the labour force, nearly all of whom are the male regular employees of large firms or of government. The percentage of workers in Japan with average tenure greater than 20 years was 21.4% in 1998, the highest in the OECD (the OECD average was 15.9%). Ono finds that lifetime employment is far from universal in Japan, but that its prevalence has changed little in recent decades.

Japanese workers have, on average, less job mobility and steeper wage-tenure profiles than do workers in other developed countries, but does this mean that Japanese employment practices are rooted in distinctive features of culture and history unique to Japan? This question of distinctiveness is addressed in a useful way by the political science literature on 'varieties of capitalism'. In a seminal contribution to this literature, Estévez-Abe et al. (2001) argue that the ubiquitous company-specific skills that gave rise to lifetime employment and seniority-based wages in Japan evolved in tandem with institutions and government regulations that afford employment protection and promote on-the-job training. Japan's employment practices belong to a set of complementary and mutually reinforcing institutions. Japan has strong protection of employment, low unemployment insurance, extensive company-based vocational training and a coordinated system of labour relations that protects wages. All of this increases the economic return to workers and employers from investment in company-specific skills. The many who benefited from these investments, and who have company-specific skills, are an entrenched political force supporting perpetuation of the status quo.

Japan's labour market institutions can be contrasted with those of the USA or others that promote and reward investment in general skills rather than company-specific skills. As Estévez-Abe et al. point out, a system like Japan's that promotes company-specific skills will tend to have gender-segregated roles in the workplace and in the family, low rates of radical innovation, and low rewards to academic education, but effective vocational training for those with weak academic skills. A system like that of the USA will have the opposite. Recent research by economists has explored such consequences of the Japanese employment system, both favourable and unfavourable.

Ariga et al. (2013) document the elaborate, career-long, on-the-job training of the regular employees of two Japanese automotive manufacturers. Based on original survey data, they show that the training responds to macroeconomic shocks in a way that preserves wages and employment, while enabling flexible adjustments in the scale of production and variety of products. This shows some strengths of the Japanese employment system. Kohara et al. (2013) focus on an unfortunate aspect of the same system. Analysing microdata from the Japanese employment security office, they show that unemployed workers in Japan who prolong their job search do not end up with more satisfactory job matches, ones that result in longer tenure. The unemployed in Japan, it seems, do not have skills that are in much demand by any employers.

There are still other consequences of an employment system like that of Japan. The Japanese employment system has induced very elaborate institutions for transitioning from the formal education system to employment. This system is generally effective at matching new recruits with employers, but is disrupted by recessions. Genda et al. (2010) show that cohorts in Japan who have the misfortune of completing their formal educations in the troughs of recessions are permanently disadvantaged by having begun their careers with less than ideal matches to employers. They also show that this effect is much stronger than for the

American counterparts of these Japanese cohorts, particularly when comparing the less educated workers in the two countries. The Japan–USA difference surely reflects the elaborate Japanese institutions for placing new high school graduates with employers, and the general difficulty of switching jobs in Japan, where employment protection is strong and on-the-job training is pervasive.

Saving

Japanese saving patterns closely fit the Modigliani life-cycle theory. In the life-cycle framework, the slowing of growth constricts the saving of the young, and proliferation of elderly persons enlarges the dissaving of retirees, both of which reduce national saving. As Japan's economic growth has slowed and its population has aged, its national saving rate has indeed fallen. This fits the life-cycle model. But as argued in detail by Chen et al. (2006), changes in aggregate saving in Japan from 1956 to 2000, which are positively correlated with macroeconomic economic growth and inversely correlated with real interest rates, can also be explained by a Ricardian model, in which households save not for their own post-retirement consumption, but to pass wealth on to their descendants. The aggregate time-series data are not conclusive on the applicability of the life-cycle model to Japan. But the micro-evidence does show that the life-cycle model is true for Japan.

Horioka (2010) analyses data on saving by those over 60 years old, both retirees and those still working, reported in Japan's Family Income and Expenditure Survey since 1995. He finds that households in which one or both spouses are over 60 years old dissave and that this tendency has become more pronounced in recent years. As the life-cycle framework implies, dissaving of the elderly is an important component of Japan's recent decline in national saving.

Alternatives to the life-cycle model (essentially the Ricardian framework already alluded to) focus on altruistic bequest as a motivation for saving. Bequests need not be altruistic. Accidental bequests and strategic bequests are consistent with selfish, life-cycle saving. Strategic bequests are actually payment for the attentions of beneficiaries, a form of consumption. Accidental bequests represent the failure to exhaust wealth on one's own consumption, merely because of the unanticipated shortness of life. Horioka (2014) describes the previous empirical evidence on altruistic versus selfish bequests, both in Japan and elsewhere, and also presents some new survey evidence. As he discusses, previous studies have established that correlation between bequests from parents to children and the children's care, attention and assistance of parents is weak in the USA but relatively strong in Japan. Furthermore, American parents are more likely than Japanese parents to divide their bequests equally among children, suggestive of altruistic motivations for bequests in America but more selfish motivations in Japan. For example, children in Japan are likely to receive larger bequests if they live with their parents than if they do not, which suggests a *quid pro quo* aspect of the bequests, characteristic of selfish rather than altruistic motivation. Horioka's new data on bequest plans comes from a survey conducted, on behalf of Osaka University, in Japan, China and India. Among the questions included in the survey were ones pertaining to the motivations for bequests. Respondents in India were the most likely to plan unconditional bequests, followed by respondents in America, China and then Japan. Those planning to condition their bequests on care and assistance provided by children during old age were more prevalent in Japan and China than in India and America. The picture that emerges is a greater prevalence of altruistic bequests in America and India, and of selfish, life-cycle bequests in China and Japan. Wakabayashi and Horioka (2009) further show that Japanese parents who are homeowners, or who are relatively wealthy, or whose children are less educated, are more likely to live with their children. All of this is consistent with selfish motives; the Japanese bequests are, in part, compensation for the attentions of their own children.

The logical complement of saving is consumption. And the permanent income model of consumption is a variant of the life-cycle model of saving. It holds that individuals will adjust their

consumption according to a lifetime plan, smoothing it out over their years of life, and so change their consumption only if new information about the future trajectory of income induces a change in lifetime plan. In the permanent-income model, fluctuations in income that are anticipated, and so embody no new information, would have no effect on consumption. Stephens and Unayama (2011) analyse the effect of a change in disbursement of Japanese public pension benefits in February 1990, from four times each year to six times each year. In the permanent-income framework such a fully anticipated change should have induced no change whatever in consumption. Examining individual panel data from the Japanese Family and Income Expenditure Survey, Stephens and Unayama show that it actually induced a statistically significant but economically trivial change in consumption. Households consume slightly more in months after receiving payments. This result may be useful as a benchmark for evaluating econometric analyses of consumption in more opaque settings, as in Kohara and Horioka (2006). It poses no serious challenge to the broad applicability in Japan of the life-cycle–permanent-income framework.

A final and decisive bit of evidence favouring the life-cycle framework over the Ricardian framework, as applicable to Japan, is that the recent and sizeable expansion of Japanese government debt has not elicited an offsetting increase in private saving. If (Ricardian) altruistic bequests were prevalent, then Japanese citizens would have enlarged their bequests to offset the increased future taxes that will burden their descendants.

Government Debt

Japan's enormous government debt is a legacy of the 1990s lost decade, the Lehman-shock recession, and fiscal impact of the aging of the Japanese population. General government debt (both national and local government debt) in Japan, netting out debt held within the government itself, has grown from 50% of GDP in 1998 to 113% of GDP in 2011, and is predicted to grow even more in the near future. This is large compared to the experiences of most other developed countries, and compared to Japan's own history. Yet, as of July 2014, the benchmark nominal yield on Japanese government 10-year bonds is extremely low, at 0.54%. The bond market clearly expects no default. This situation prompts two questions: first, is the large and growing Japanese government debt sustainable? And, second, why are the interest rates on Japanese government debt so astonishingly low?

An unsustainable government debt is one that, without major retrenchments of government spending or significant expansions of taxes, would continue to grow until the government must either default or debase the currency. Sustainability of government debt is not a precise concept. In an influential essay, Broda and Weinstein (2004) argued that Japanese government debt was sustainable, in the sense that a sizeable but politically tractable increase in taxes (equal to 9% of GDP) would suffice to align tax revenues with government expenditures. Since they wrote, the 2008 Lehman shock has happened and Japanese government debt has ballooned, but even this rise in outstanding government debt is small in relation either to the present value of the future stream of government spending or of government revenue. Doi et al. (2011) find that an increase in taxes equalling between 7% and 14% of GDP would align government revenues and expenditures, approximately what Broda and Weinstein had calculated earlier. But Doi et al. consider such a tax increase to be of extraordinary magnitude, a departure from the current fiscal regime, which (*contra* Broda and Weinstein) they therefore characterise as unsustainable. Ito (2011) reviews statistical tests pertinent to the sustainability of government debt. These include tests that government spending is cointegrated with tax revenue (long-run sustainability), and whether an error-correction process that would eventually align tax revenue and expenditures is evident in the time series (short-run sustainability). Ito finds that short-run sustainability, in the sense just defined, failed in Japan from about 1998.

The extremely low interest rates on Japanese government debt are a puzzle for those who regard a drastic change in Japan's fiscal regime as

unlikely, yet necessary to avert monetisation or default. Other countries have defaulted on their sovereign debt. And even Japan, in the war years, monetised a massive government debt. Why do bond investors believe that 'this time is different'? Should they believe it? Hoshi and Ito (2013) argue that Japanese institutional investors have a strong home bias in their choice of asset portfolio. Japanese banks prefer to hold Japanese government bonds, even at very low interest rates, because government bonds carry a large weight in the Basel formula for calculating minimum required bank capital ratios, and because they can avoid foreign exchange rate risk by holding yen-denominated securities. Horioka et al. (2013) also point to home bias as well as other reasons for low Japanese government bond yields. The other reasons include the (until recently) high private saving rate in Japan and the fall in foreign interest rates after the Lehman shock that caused a surge in foreign holdings of Japanese sovereign debt.

Distribution of Wealth and Income

The distribution of wealth and income in society, with particular focus on the super-rich, has become a topic of the day. The impetus for this is a wide presumption that, in the developed countries, those at the very top of the income distribution are attaining unprecedented riches while the great majority of workers are struggling just to get by. But is the presumption true? And if so, what is causing it? This requires careful empirical study. Japan is an important case to consider because it is a highly developed nation with a market economy and an affinity for egalitarianism.

The changing distribution of income in Japan from 1886 to 2005 is well documented by Moriguchi and Saez (2008). The starting year of their investigation is the initiation of an income tax in Japan, decades earlier than occurred in most other nations. Moriguchi and Saez carefully sift through published data from Japan's income tax statistics to show that between 1886 and 1938 the highest one percentile of the adult population by income (the top 1%) received from 14% to 20% of total personal income. During the Second World War this fell, and then from 1946 to 2005 it fluctuated between 7% and 9%. In contrast, the next highest four percentiles (the top 5% to 1%) together received an average of 12% of total personal income between 1886 and 1938, and from 1946 to 2005 received between 13% and 16% of total income. In short, personal income in Japan was more concentrated before the Second World War than in the years since then, and has shown no significant trend towards changing concentration in recent decades. Most of the de-concentration of income during the war years was from the fall in share of total income claimed by the top 1%.

Atkinson et al. (2011) place the Moriguchi and Saez (2008) data alongside analogous data (long-run time series on the distribution of income constructed from income tax statistics) for other countries, 22 in all, including Japan. They show that the pattern in which the top-percentile share of total income fell during the Second World War and has remained low in the decades since (an L-shaped trajectory) is true not only of Japan but also of France, Germany, Switzerland and the Netherlands. However, in the USA, UK, Canada, Ireland, Australia and New Zealand, the top-percentile share of total income fell during the Second World War, but in the years since 1985 it has steadily increased to its previous level or higher (a U-shaped trajectory), particularly in the USA. Other countries they examine lie somewhere between these cases.

So what are we to make of these patterns? Catastrophes like the World Wars and the Great Depression destroyed wealth and narrowed the gap between the rich and the poor in all countries. But the effects were more persistent in countries like Japan, where wealth bequests tend to be small. Alvaredo et al. (2013) further suggest that where top income tax rates are lower, those with high incomes bargain more aggressively for a larger share of economic rent, which further widens the gap between rich and poor. This could be one reason why top CEOs in the USA now earn a much higher multiple of the blue-collar wage than is true in Japan. It reflects successful rent-seeking by the CEOs and their ilk, not just the high productivity of their labour.

Ohtake (2008) draws some interesting contrasts between Japanese and American attitudes about income inequality, based on an original survey questionnaire distributed in both countries on behalf of Osaka University in 2006. About three-quarters of the respondents in both countries regard widening income inequality as a problem, but the reasons differ. In Japan, about half of the respondents have a negative perception of income differences resulting from talent, academic background or luck, while only about a quarter of the US respondents have such a perception. In general, American attitudes favour equality of opportunity over equality of outcome, whereas Japanese attitudes are the opposite. To put it bluntly, the Japanese think that effort alone should determine income, whereas Americans believe that, for the benefit of society, effort by the more talented should be more rewarded.

Regulation

A frequent claim is that, in Japan, compared to other developed nations, government regulation is ubiquitous and intrusive. This claim merits deeper study; the effects of government regulation have not been as fully documented in Japan as in the USA, although there are some recent studies worth mentioning. In a much-cited report, Hoshi and Kashyap (2011) list government regulatory restrictions as one of three prominent reasons that the Japanese economy has stopped growing (their other two reasons are misdirected bank loans and macroeconomic policy mistakes). Their empirical measure of regulatory restriction is a dataset compiled by the Cabinet Office of the government of Japan that categorises the regulations pertaining to each industry and sub-industry (roughly 4-digit SIC (Standard Industrial Classification) industries). The categories are such things as whether a licence is required, whether compliance with safety standards must be demonstrated and whether information must be reported to the authorities; also whether the stipulations are based on statute, ministerial directive or advisory notice. Such a measure, at best, identifies which industries are subject to any specific government oversight at all and which are not. It does not identify the precise extent to which government regulations in each industry constrain entry, pricing or production. Unsurprisingly, Hoshi and Kashyap find that the Cabinet Office measure of regulatory stipulations is only weakly related to variation in total factor productivity across industries and over time, but in the way that they expect. That is, regulatory stipulations seem to reduce productivity, though the effect is not statistically significant.

To understand the effect of government regulation in detail requires industry-by-industry analysis. There have been a few studies like that for Japan. Flath (2001) documents the effects of regulation of truck transport in Japan, and the effects of the significant relaxation of regulation of fares and entry introduced there in 1991. The Japanese trucking regulation was enacted during the US occupation and to some extent modelled on the US statutes. But truck regulation conferred much smaller economic rents in Japan than it did in the USA (from 1935 to 1980). In Japan, the main effect was, and still is, to prevent private truckers (mostly private department stores and the like, with their own fleets of trucks delivering goods to their own customers), from also undertaking commercial business. This benefits commercial trucks, but falls far short of full cartelisation. The economic waste it imposes arises from the unnecessarily empty backhauls it causes. The changes in regulation introduced in 1991 were not to break a cartel, but to better accommodate an expansion of parcel delivery service. Parcel delivery service had become ripe for expansion owing to some innovations such as radio communication with drivers and improvements in logistics. In short, in Japan, trucking regulation conferred modest rents on commercial trucking, but did not effectively cartelise the industry. The 1991 change in regulation, mainly expanding the scope of rights conferred by the holding of a commercial truck license, was triggered by technological advances in parcel delivery service that had made the social cost of the old regulation larger than it was before. Technological advance caused deregulation, not the reverse.

The economic effects of a regulation should be considered within the context of the political equilibrium which gave rise to it. Regulation of

industry is not an exogenous constraint imposed willy-nilly. It is the result of political pressure by those who benefit from its effects over opposition by those who are harmed. As Becker argued, the economic waste that arises when the harm is greater than the benefit has an effect similar to a tax on political pressure in support of the wasteful regulation. The political equilibrium is always being nudged by that 'tax' in the direction of economic efficiency – it may not get all the way there. But when the economic wastes of a regulation become large and visible, the regulation is more likely to be changed. The regulation protecting small stores in Japan from competition by large stores is another illustrative case.

Japan has long had more stores per person than most other nations. Regulations limiting entry by stores with large floor space contributed to this. The 1937 Department Store Act and (much later) the 1973 Large Scale Retail Store Law, restricted the construction and opening of stores with large floor space all over Japan, but with local variation in the strictness with which it was applied. But as shown by Flath (2003), fundamental correlates with the costs and benefits of proliferation of stores (population density, car ownership and sizes of dwellings), explain most of the geographic variation in density of stores, both within Japan and across countries. Regulations protecting small stores from competition by large stores in Japan have had a measurable but small effect on the number of stores. The regulations were enacted because fundamentals like geography that favoured the economic efficiency of small stores meant that small store owners were numerous and could be politically forceful in supporting regulation that protected them, because the same fundamentals meant that the regulation imposed relatively small deadweight losses. When those deadweight losses became large, the political equilibrium shifted. With the ongoing suburbanisation of Japan and increase in car ownership, large stores on the peripheries of cities became more valued, and in 1998 the Large Store Law was repealed. Regulation protecting small stores in Japan could only be sustained politically as long as the deadweight losses it imposed were relatively small.

Where the same corresponding industry is regulated in many different countries, over many years, we should expect there to be some economic benefit from the regulation. Regulation that is simply cartelising is unlikely to be as durable and ubiquitous. In Japan, as in many other nations, taxi services have long been subject to government control of fares and entry. The existence of vacant cabs shortens the waiting time for the demanders of taxi services, so the cost of operating a set average number of vacant cabs is a fixed cost of supplying taxi services with given average waiting time. This means that a taxi industry has economies of scale. Flath (2006) argues that regulation of taxi fares and entry, in Japan and elsewhere, improves resource allocation by countering some of the distorting effects of the industry scale economies, which may account for the ubiquity and durability of taxi regulation.

Convincing descriptions of the effects of government regulation usually require detailed scrutiny and modelling of the specific constraints that the regulation imposes on private firms. Ideally, this framing of the regulatory constraints is then joined with econometric estimates that measure the behavioural responses to these constraints. This kind of study is very difficult to execute. In an excellent example of the genre, Kondo and Shigeoka (2013) detail the long-run supply and demand responses to the 1961 expansion of public health insurance in Japan. They find that the expansion of health insurance, with reimbursement of physicians and hospitals according to set fee schedules, elicited an increase in utilisation of health services, but without a corresponding increase in the numbers of doctors, nurses or hospitals. In another recent study of economic responses to government health insurance in Japan, Iizuka (2012) finds that doctors in Japan act as imperfect agents of their patients in choosing whether to prescribe generic or branded versions of similar drugs. The drug prices are regulated and the drugs themselves are often dispensed by the same physicians who prescribe them. With statistical analysis of micro-data, Iizuka shows that, of the drugs that they dispense, doctors in Japan are inclined to prescribe ones with higher markups. This often means

prescribing a branded drug, even though an equally effective and lower priced generic version is available.

Industrial Organisation

Japan-related research in industrial organisation has shifted away from its previous focus on institutions and practices peculiar to Japan, like the financial keiretsu, cross-shareholding or Toyota subcontracting system. In part, this is because Japan's peculiar institutions are less prominent now. But probably also, keiretsu groups and the like never did matter as much to the behaviour of Japanese firms as sometimes claimed. Miwa and Ramseyer (2002) suggest that membership in the financial keiretsu cannot be defined in a coherent way and is devoid of economic significance, a robust challenge to conventional views. McGuire and Dow (2009) document the demise of the financial keiretsu both as an economic institution and subject of academic study.

The once-standard view was a Japan dominated by large firms in concentrated industries, bound to one another through keiretsu ties and other alliances, unimpeded by antitrust laws, with their small penalties for collusive price-setting that were rarely imposed. Porter and Sakakibara (2004) well describe this view of Japanese industry and the academic research that promoted it, and some research that challenged it. The standard view of Japanese industry as being anti-competitive never was convincing. The main thing inhibiting cartels is cheating by their own members, not the threat of antitrust penalties. Small antitrust penalties and weak enforcement do not therefore imply widespread collusion. Furthermore, in Japan as elsewhere, much antitrust enforcement is directed at the marketing practices of large firms with successful products, which have little to do with cartels or collusion. For example, Flath and Nariu (2008) review the recent cases in which the Japan Fair Trade Commission, enforcer of Japan's anti-monopoly law, ordered some sole import agents of foreign firms to desist from their obstruction of parallel imports. Parallel imports here mean the sale in Japan of products of a foreign company, by one other than the agent designated by the foreign company. In the preponderance of cases, the obstruction of parallel imports was necessary to preserve a directed marketing system (that is, one having stipulated resale prices and other such vertical restraints), set up and managed within Japan by the sole agent. The goal of such a marketing system is to align the incentives of wholesale and retail distributors with those of the producer and sole importer – that is, to attain maximum profit in the marketing channel for the one particular brand. It is not a cartel. Antitrust interference with directed marketing channels increases marketing costs, which reduces supply, raises prices and harms consumers. Weak antitrust laws could actually improve resource allocation and be a blessing for Japan rather than a curse. In the same vein, Japan's special exemptions from antitrust law pose little concern. Flath (2013) empirically analyses the resale price maintenance by Japanese newspapers, which is specifically exempted from antimonopoly law by a directive of the Japan Fair Trade Commission (JFTC), and finds that the subscription prices remain well below the cartel level. The motivation for the resale price maintenance seems not to be cartelisation.

Japan's industrial concentration is also benign. It is unsurprising that Japanese industries should have fewer firms than their corresponding US industries. Japan has about half the population of the USA (127 million versus 300 million), so Japanese industries face smaller demand than US industries. In both countries, the industries in which firms have greater scale economies tend to be more concentrated than others. Flath (2011) estimates Cobb-Douglas production functions for 74 four-digit SIC manufacturing industries in Japan, 1961–1990, and explores some of the cross-industry patterns in concentration, pricing and innovation. The industries having greater capital intensity and small employment of labour tend to be more concentrated. That is, scale economies influence concentration in a way that is consistent with free entry. Also, there seems to be a U-shaped mapping from industry concentration to innovation. Flath (2012) shows that the price–cost

margins of these same industries tend not to vary over time in proportion to changes in the Herfindahl index of concentration. A simple interpretation of the data is that the modal Japanese manufacturing industry is a product-differentiated Bertrand industry in which the seven or so major firms each face a demand with elasticity of ten or greater.

Even if an industry is non-collusive, for example in a Nash–Bertrand non-cooperative pricing equilibrium, it may still lack dynamism: a competitive drive to seek new products and improved technology. An industry that does have this kind of dynamism might exhibit more frequent changes of the firm with the leading position – the greatest market share. Sutton (2007) characterises transience of industry leadership as consonant with the Schumpeter view of innovation as ongoing, and its opposite, persistence of leadership, as reflecting the Chandler view that the capability of a firm is a slowly changing attribute. He examines the annual changes in which firm has the greatest market share in each of 45 five-digit SIC Japanese manufacturing industries over 23 years, 1974–97. Sutton finds a slight bias towards Chandlerian persistence of leadership. The same bias may be present in other countries; Sutton's evidence does not establish that Japanese industries are less innovative than those of other nations.

Conclusion

This article has described recent scholarship on the Japanese economy. Although it describes work in many different fields of economics, it is not comprehensive. For instance, there is no mention here of research on Japanese economic history. Nor is there much attention to work on the organisation and governance of Japanese firms. Neither does it include studies of the Japanese economy rooted in disciplines other than economics. There is nothing here about sociology, and little about politics and government. Even in spite of these omissions there has been much to discuss. All of the research described here uses concepts and methods of analysis that will be familiar to most professional economists. And a lot of the best research on the Japanese economy is not done by Japanologists, Japanophiles or Japanophones. Those who would build on the research described here need only a mastery of economics and a willingness to engage with the data.

See Also

► Japan, Economics in

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Jaszi, George (1915–1992)

E. Denison

Keywords

Government accounting; Jaszi, G.; National income accounting; National product accounting

JEL Classifications

B31

Research administrator and expert in national accounts. Born in Budapest, Jaszi attended Oberlin College, the London School of Economics (BSc, 1936) and Harvard (Ph.D., 1946). He was employed by the Bureau of Economic analysis (or its predecessors) in its National Income Division 1942–59 (Division Chief 1949–59), as Assistant Director 1959–62, and as Director 1963–85.

Jaszi helped develop the US national income and product accounts that were introduced gradually during the Second World War and fully in 1947. The accounts for the government sector were his unique contribution. One aspect of this is that all government purchases, like other purchases not for resale, are counted as final products. For four decades Jaszi influenced the United Nations standardized system in addition to guiding the United States accounts. His firm grasp of the national income and product accounts as an integrated system and of the principle that they

must rest upon quantifiable concepts made him particularly skilful in explaining and vindicating the 1947 system and its subsequent improvement. Jaszi's (1958) exposition of the accounts and responses to critics at a 1955 conference and his (1971) critique of comments by 46 economists were masterful. Elsewhere (1964), Jaszi showed that hedonic and conventional methods of allowing for quality change in output measurement are conceptually equivalent.

During 1963–85 Jaszi directed all the varied statistics and analyses of the Bureau of Economic Analysis – international, national and regional. Many improvements were introduced during his tenure. He closely supervised BEA's *Survey of Current Business* and co-authored its 'Business Situation' section. His talks (for example, Jaszi 1972) helped balance exaggerated claims of (*a*) damage introduced into policy formulation by errors of estimate in the NIPA and (*b*) the possibility of greatly reducing such errors.

See Also

► National Accounting, History Of

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J-Curve

Giorgia Giovannetti

Abstract

The J curve is the description of an empirical phenomenon: the trade balance worsens immediately after a depreciation of the exchange rate, to improve in the longer term. This pattern can be ascribed to different speed of adjustment of trade prices and volumes to changes in exchange rates. Several models have been put forward, suggesting explanations for these lags that are not mutually exclusive. While the empirical evidence is not conclusive, to assess the existence of a J-curve adjustment path is relavant since the J-curve may induce dynamic instability in the exchange rates.

Keywords

Balance of trade; Common pool problem; Consumption habits; Currency depreciation; Hysteresis; J-curve; Marshall–Lerner conditions; Real business cycles; Structural vector autoregressions; Sunk costs; Technology shocks; Terms of trade

JEL Classifications

F1

A depreciation of the domestic exchange rate is expected to improve a country's trade balance. It has been observed, however, that in reality the trade balance often worsens immediately after depreciation. Only in the longer term, if at all, does it improve. The combination of a negative short-run effect together with a subsequent positive long-run effect of a devaluation of the exchange rate on the trade balance is referred to as the 'J-curve' due to the similarity of the current-account behaviour to a 'J'.

To assess the existence of a J-curve adjustment path is relevant, since, under most circumstances, the J-curve may induce dynamic instability in exchange rates (see Beenstock 1990; Levin 1985). If depreciation worsens the trade balance in the short run, the exchange rate may fall further (depreciate more). Although export volumes may rise and import volumes fall, import values tend to grow faster than export values and the exchange rate instability persists. This instability may be neutralized by speculators having rational expectations. In this case, agents know the dynamics of the J-curve and allow for it in their speculative behaviour, thereby eliminating the potentially destabilizing influence of the J-curve itself.

The J-curve is the description of an empirical phenomenon, first discussed after the 1967 devaluation of the pound sterling in NIESR (1968) and analysed in a seminal paper by Magee (1973). Theoretical models have been developed, building on some kind of frictions, such as pre-existing contracts, asymmetric use of domestic currency and foreign (international) currency, sluggishness in adding new productive capacity and sunk costs.

The lags in the adjustment can be ascribed to trade prices adjusting faster than trade volumes to changes in the exchange rate. The currency in which imports and exports are denominated, which is likely to be determined by the relative market power of traders, plays a crucial role. When both import and export contracts are expressed in domestic currency, following an unexpected devaluation, the value of existing imports rises due to the increased cost of an unchanged quantity of imports, while the value of existing exports remains constant (the price of exports in domestic currency does not change). The existence of lags on consumers' and producers' side induces stickiness and a worsening of the trade balance, until higher export and lower import volumes eventually, and on the assumption that import and export demand elasticities are sufficiently elastic to exchange rate changes so that their sum is higher than 1 (that is, the Marshall–Lerner conditions hold), generate a favourable trade balance response (that is, a J-shaped path). When both import and export contracts are expressed in foreign currency, if the value of contracts denominated in foreign currency is higher for imports than for exports, the J-curve will always ensue. On the other hand, the trade balance would improve immediately after devaluation if import contracts are denominated in domestic currency and export contracts in foreign currency.

Quantities may not adjust rapidly to exchange rate changes, since domestic demand for imported goods may be fairly inelastic due, for instance, to a reputation or brand and/or domestic supply may be a poor substitute for imported goods. Furthermore, producers may not be able to reallocate expenditure between foreign and domestic goods since most import and export orders are placed in advance (before depreciation). In the long run, however, quantities tend to adjust and, if the value of elasticity satisfies Marshall–Lerner, the trade balance improves.

Several models have suggested not mutually exclusive reasons for a short-run deterioration of the trade balance following depreciation. Knetter (1993, p. 473) maintains that: 'sellers reduce markups to buyers whose currencies have

depreciated against the seller, thereby stabilising prices in the buyer's currency relative to a constant markup policy', that is, follow a 'local currency price stability' and differentiate between markets (pricing to market). Some models rely on the small open economy hypothesis and emphasize intertemporal substitution. Bacchetta and Gerlach (1994) challenge the view of a *rapid* pass-through of exchange rates to import prices, showing that the J-curve can arise even if import prices are sticky. In an intertemporal framework, an anticipated rise in future import prices after depreciation provides agents with an incentive to decrease their current expenditure and therefore revise their future purchases, eventually displaying a J-shape dynamics of trade balance.

In a continuous time open-economy framework, Mansoorian (1998) shows that a trade balance deterioration following depreciation can be due to persistence of consumption habit, on the assumption that the utility function depends not only on current consumption but also on standard of living. Similar conclusions have been recently reached by Cardi (2005) who derives a J-curve due to the 'strength' of consumption habits and capital investment 'inertia', following an unanticipated terms of trade deterioration.

Tivig (1996) solves an intertemporal maximization problem in a dynamic oligopoly contest. In a two-period model of duopolistic competition without entry, regardless of the degree of capital mobility, she provides sufficient (at least) conditions on import demand elasticity for short-run 'perverse' price reactions, following temporary changes in the exchange rates, so that a temporary devaluation may initially worsen and later improve the trade balance.

Tornell and Lane (1998) use political economy considerations to explain the J- curve pattern; their model with 'voracity effects' suggests that a positive real trade shock may exacerbate the *common pool problem*, leading to a more than proportional increase in public transfers and then to a social loss. Because of this effect, the impact of an unexpected improvement in the terms of trade may lead to deterioration in the current account.

Recent literature in dynamic general equilibrium depicts an S-curve as a dynamic response of the trade balance to technology shocks. Backus et al. (1994) find that the trade balance is negatively correlated with current and future movements in terms of trade, but positively correlated with past movements. Using a two-country version of Kydland and Prescott's (1982) closed economy model, in which each country produces imperfectly substitute goods with capital and labour, they claim that, after a once and for all positive shock to technology, domestic output increases, its relative price falls and domestic investment increases, inducing a fall in net exports. With time, the rise in investments decreases and the trade balance moves into a surplus. This dynamic gives rise to an S-curve consistent with the J-curve, since the initial deterioration and subsequent improvement of the trade balance may well deliver also an S-shaped cross-correlation function of the trade balance and the terms of trade. Senhadji (1998) extends the Backus, Kehoe and Kydland analysis to document business cycle features of several developing countries. Within a set-up with a downward sloping export demand function and limited access to international financial markets for capital formation, he shows results completely supportive of the findings of Backus, Kehoe and Kydland.

Finally, the J-curve can be due to hysteresis (cf., for instance, Baldwin 1988; Dixit 1994). In the presence of sunk costs, to export is an 'option' and consumers value the alternative of 'wait and see' before reacting to exchange rate changes. The presence of a threshold induces non-standard behaviour of the trade flows when the exchange rate depreciates.

Over the years, an extensive empirical literature has emerged. Results are not conclusive. As stated by Bahmani-Oskooee and Artatrana (2004, p. 1389), 'the general consensus is that the short run response of the trade balance to current depreciation does not follow a specific pattern' but, if a J-curve exists, the perverse effect has a duration of one to three years (see Junz and Rhomberg 1973; Baldwin and Krugman 1987; Spitaller 1980; Moffett 1989). Koray and McMillin (1999) use a structural VAR model to show that the pattern of the trade balance after a negative monetary shock

exhibits the traditional J-curve behaviour. Support for the J-curve hypothesis has been found also by Bahmani-Oskooee and Alse (1994), Marwah and Klein (1996) and Hacker and Abdulnasser Hatemi (2003). Leonard and Stockman (2002) find a weak positive evidence of the J-curve, but document strong violations in the distributional assumptions that underline previous works. More interestingly, their evidence on the J-curve is inconsistent with traditional theoretical explanation (real business cycle models included), since they present evidence that current account surpluses are usually associated with low real GDP.

Other studies have challenged the existence of a J-curve: Rose and Yellen (1989) and Rose (1990,1991) maintain that, if import prices adjust slowly to exchange rate changes, the initial negative effect embodied in the J-curve may not occur: the value of imports does not increase and, *ceteris paribus,* the trade balance does not worsen. More recently, Demeulemeester and Rochat (1995), Hsing and Savvides (1996), Shirvani and Wibratte (1997) using different methodology, different data-set and estimating over different periods, found no evidence of a J-curve in the data.

See Also

- ▶ Elasticities Approach to the Balance of Payments
- ▶ Exchange Rate Dynamics
- ▶ International Finance

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Jefferson, Thomas (1743–1826)

Henry W. Spiegel

The author of the Declaration of Independence and third President of the United States took a profound interest in the intellectual currents of his time that extended to economics. He was a friend of leading physiocrats, and energetically promoted the study of political economy in the United States. When in his seventies, the former president spent five hours a day over a period of three months revising the translation from the French of Destutt de Tracy's *Treatise on Political Economy*, which was eventually published in Georgetown, D.C., in 1817, after Jefferson had written more than 20 letters in search of a publisher.

Jefferson himself did not publish a systematic work on economics. His economic ideas can be gleaned from his *Notes on Virginia* (1785), his wide-ranging correspondence, and his activities in the service of the nation. His overriding aim was to perpetuate the rural economy characteristic of his native Virginia. He was deeply suspicious of banks, paper money and public borrowing, which he saw providing opportunities for financial manipulation and chicanery. He rejected government promotion of industrial development by subsidies or tariffs, and instead proposed to rely on imports of manufactures from abroad. His ideas ran counter to those of Alexander Hamilton, with whom he served in President Washington's cabinet. Although he outlived Hamilton by many years and attained the highest office in the land, the further development of the American economy was more in line with Hamiltonian than with Jeffersonian ideas. The force of circumstances and of incipient institutions caused Jefferson himself to assign to government an active role in economic development by imposing restrictions on foreign trade, nearly doubling the territory of the United States by the Louisiana Purchase, and promoting the development of the West with the Lewis and Clark Expedition. While the future course of the American economy was not shaped by Jefferson's ideals, his system of democratic values has served to this day as a principal factor integrating the American political community.

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Jenkin, Henry Charles Fleeming (1833–1885)

R. D. Collison Black

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JEL Classifications

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Jenkin was a distinguished engineer whose wide interests and clarity of mind enabled him to make notable contributions to economic analysis.

Jenkin received his early education at Edinburgh Academy, but financial exigencies forced the family to move first to France and then to Italy. Consequently, Jenkin graduated from the University of Genoa in 1850. Returning to England in 1851, he spent ten years with various engineering firms working on the design and laying of submarine cables. In 1859 he became associated with William Thomson (Lord Kelvin) and frequently collaborated with him in later years, especially in contributing to the work of the British Association's Committee on Electrical Standards. In 1866 Jenkin was appointed Professor of Engineering at University College, London, and moved to a similar chair at the University of Edinburgh in 1868. Apart from his work in civil and electrical engineering, Jenkin distinguished himself as a critic of Darwin's theory of evolution, as an advocate of improved urban sanitation, and for the development of the system of monorail electric transport called telpherage.

Between 1868 and 1872 Jenkin published three economic papers whose theoretical quality and practical value have since earned him a deserved place in the history of economic thought. Recognizing that in current debates on trade unions 'the principles of political economy though often quoted are little understood', Jenkin set himself in his first paper to examine their application to the labour market. In the process he revealed the emptiness of the wages-fund concept, refuted the view that trade unions could not materially benefit their members and made the first clear statement in English economic writing of the concept of supply and demand as functions of price. These ideas he further developed and generalized in his 1870 paper, in which he analysed fully the determination of market price using diagrams to present the supply and demand functions in the form of intersecting curves. Jenkin specifically noted that in the long-run cost of production chiefly determines the price of manufactured goods, but stressed 'how much the value of all things depends on simple mental phenonema, and not on laws having mere quantity of materials for their subject' (1887, vol. 2, p. 93).

In a third paper Jenkin applied his techniques of supply and demand analysis to the problem of tax incidence, stating the concept of consumers' surplus previously developed by Dupuit but apparently without knowledge of Dupuit's work.

Jenkin left two further essays on economic issues, which were published posthumously in his collected *Papers, Literary, Scientific, &c.* In 'Is one Man's Gain another Man's Loss?' (1884) he used a simple form of closed circuit diagram to illustrate the exchange process and its results. 'The Time–Labour System' contained an acute diagnosis of the differences between goods markets and labour markets with a proposal to improve the operation of the latter through what was in effect a system of guaranteed annual wages.

All Jenkin's economic writings were characterized by a striking combination of precise and lucid analysis with tolerant understanding of the facts of daily life in both the workshops and the counting-houses of the world he knew. In view of this their influence in his own time was surprisingly limited, although his 'Graphic Representation' (1870) does seem to have afforded the stimulus which led W.S. Jevons to publish his *Theory of Political Economy* in 1871.

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Jennings, Richard (1814–1891)

R. D. Collison Black

Educated at Eton and Trinity College, Cambridge; called to the Bar 1838; afterwards Deputy Lieutenant and High Sheriff of Carmarthenshire.

Jennings was the author of two works (listed below) which are notable as early attempts to relate the study of psychology and physiology to political economy. In his *Natural Elements,* Jennings defined political economy as investigating 'the relations of human nature and exchangeable objects'. Consumption he defined as concerned with the contemplated effect of external objects upon man, and Production with the contemplated effect of man upon external objects. Jennings's treatment of the sensations attending consumption led Jevons to describe him as 'the writer who appears to me to have most clearly appreciated the nature and importance of the law of utility'. Hence it is as an early utility theorist that Jennings has been remembered, but his political economy had other interesting features. He forecast the use of mathematical methods, without himself employing them. In policy matters he was a sharp critic of laissez-faire and advocated the establishment of a Board of Public Economy, which might exercise control over the economy by adjustments of taxation and the rate of interest. Jennings's proposals for tax reform included a discriminatory tax to encourage women's employment and a provision for a 'considerable share' of the property of proprietors dying without close relatives to revert to the state. His work was characterized more by intriguing insights than consistently novel theorizing and was handicapped by a prolixity exceptional even by Victorian standards.

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Jevons as an Economic Theorist

Terry Peach

The story goes that Jevons, along with his contemporaries, Menger and Walras, was a Founding Father of 'neoclassical' economics. Whether this claim has much substance could be, and has been,

disputed. To mention just two issues: as Jevons candidly acknowledged, leading features of his theory had been anticipated, notably by Dupuit and Gossen (although his ideas were developed independently of theirs); and a marked, distinctively Jevonian imprint on mainstream 'neoclassical' thought is hard to distinguish, masked by the dominant influence of Alfred Marshall.

Credentials aside, the price exacted for Jevons's elevation to the patriarchy has been searching criticism from exponents of later 'neoclassical' economics (and also from adherents of other schools of thought). As well as receiving solemn praise he has been variously reproached, first, for theory he did produce, on account of its contamination by subsequently abandoned doctrines; secondly, for the absence of, or failure to develop, 'essential' 'neoclassical' doctrines; and thirdly, for lapses of internal consistency. Schumpeter's portmanteau judgement has been shared by many:

> his work on economic theory lacks finish. His performance was not up to his vision. Brilliant conceptions and profound insights . . . were never properly worked out; they. . . look[ed] almost superficial (1954, p. 826).

In what follows we will focus on Jevons's major theoretical work, *The Theory of Political Economy* (first edition 1871, second edition 1879; all references to the posthumous fifth edition of 1957). Our foremost aim is to describe the central content of Jevons's theory, remarking on its main, retrospectively perceived, weaknesses and strengths (this is merely to follow common practice, and does not reflect the author's historiographical preferences). It will also be suggested that there are grounds for reconsidering certain commonly held views on the relationship between Jevons and his 'classical' predecessors.

Mathematics, Utilitarianism and Methodology

Lionel Robbins (1936) remarked in his classic piece on Jevons, 'If it were only for its apology for the mathematical method . . . the *Theory of Political Economy* would still be memorable.' The *Theory* is indeed remarkable for Jevons's tireless advocacy of mathematical forms of reasoning, specifically of 'the fearless consideration of infinitely small quantities' (p. 3), i.e. differential calculus. He recognized, however, that he was not a 'skilful and professional mathematician', adding that when 'mathematicians recognise the subject as one with which they may usefully deal, I shall gladly resign it into their hands' (p. xiv). But there was a caveat: it 'does not follow . . . that to be explicitly mathematical is to ensure the attainment of truth' (p. xxiii). 'Truth' depended on the framing of economics as a 'Calculus of Pleasure and Pain' (p. vi), the problem of economics being 'to *maximise pleasure*' (p. 37, Jevons's italics; cf. p. 23).

This language signalled an acceptance of Jeremy Bentham's hedonistic psychology ('Utilitarianism') which has either been regarded as unfortunate by later 'neoclassicals', who believed themselves well rid of Utilitarianism, or as halfhearted to the point of non-existence: 'the Benthamite approach was thoroughly understood by Jevons and subtly rejected' (Robertson 1951; cf. Young 1912). This was probably wishful thinking: as Professor Collison Black has rightly said, 'Bentham's ideas permeated Jevons's *Theory* inescapably' (Black 1972).

Just how far this was so is seen in the second chapter of the *Theory of Political Economy*, 'Theory of Pleasure and Pain', which considered 'how pleasure and pain can be estimated as magnitudes' (p. 28), the answer distilled from Bentham: a feeling of pleasure or its negative on the same scale, pain, is a function of its intensity, duration, the (un)certainty of its occurrence and its propinquity (proximity in time) or remoteness.

Taking pleasure and pain as 'undoubtedly the ultimate objects of the Calculus of Economics', Jevons tells us in the third chapter that 'it is convenient to transfer our attention . . . to the physical objects or actions which are the source to us of pleasures and pains' (p. 37). Those which 'afford pleasure or ward off pain' are 'commodities' and those having the opposite effect are 'discommodities' (p. 58). 'Utility' is the 'abstract quality whereby an object serves our purposes, and becomes entitled to rank as a commodity' (p. 38)

and there is an analogous relationship between 'disutility' and 'discommodity' (pp. 57–8).

Utility is not an *intrinsic* quality of commodities but is 'better described as a *circumstance of things* arising out of their relation to man's requirements' (p. 43, Jevons's italics). It 'must be considered as measured by, or … actually identical with, the addition made to a person's happiness' (p. 45).

Jevons next distinguished between total utility and '*final degree of utility*', defined as 'the degree of utility of the last addition, or the next possible addition of a very small, or infinitely small, quantity to the existing stock' (p. 51). There followed a statement of the 'general law' that '*the degree of utility varies with the quantity of commodity, and ultimately decreases as that quantity increases*' (p. 53, Jevons's italics).

The 'general law' of diminishing final degree of utility was bracketed with, notably, the 'laws' that 'every person will choose the greater apparent good' and 'prolonged labour becomes more and more painful', collectively described as 'simple inductions on which we can proceed to reason deductively with great confidence' (p. 18). We have this confidence because the 'ultimate laws are known to us immediately by intuition, or, at any rate, they are furnished to us ready made by other mental or physical sciences' (ibid.).

Jevons's faith in his 'ultimate laws' was reflected in his endorsement of verificationism, a methodology which required him to find a way of measuring pleasure and pain/utility and disutility. He 'hesitate[d] to say' that they could be measured directly, arguing that *'it is from the quantitative effects of the feelings that we must estimate their comparative amounts*' (p. 11, Jevons's italics): 'quantitative effects' such as buying and selling, labouring and resting, producing and consuming. He also assured his readers that the focus would be on *incremental* variations: 'I never attempt to estimate the whole pleasure gained by purchasing a commodity' (p. 13); and he was just as emphatic that 'there is never, in any single instance, an attempt made to compare the amount of feeling in one mind with that in another', adding that 'I see no means by which such comparison can be accomplished' (p. 14).

Despite this stance, he did not restrict verification to the (incremental) behaviour of individuals. The 'laws of Economics', he claimed, 'will be theoretically true in the case of individuals, and practically true in the case of large aggregates' (pp. 89–90). The thorny problem here is that aggregate behaviour represents the 'quantitative effects' of feelings in different minds and we cannot meaningfully read back from effects to feelings, as verification of the 'ultimate laws' would require, if inter-personal comparisons are prohibited. As we shall see, however, Jevons made *explicit* inter-personal comparisons *and* drew attention to the pit-falls involved in his 'aggregative' approach.

The Theory of Exchange

Jevons's theory of exchange, developed in the fourth chapter of the *Theory*, is probably his best known piece of work. Jevons had no doubt of its significance, declaring that without a 'perfect comprehension' of the theory it was 'impossible to have a correct idea of the science of Economics' (p. 75).

The analysis rested on several assumptions. First, that of a 'perfect market' defined as 'two or more persons dealing in two or more commodities' with traders having 'perfect knowledge of the conditions of supply and demand, and the consequent ratio[s] of exchange' (pp. 85–7). Secondly, there are two 'trading bodies'. Jevons explained:

> The trading body may be a single individual in one case; it may be the whole inhabitants of a continent in another; it may be the individuals of a trade diffused through a country in a third. (p. 88).

But whatever its size, the trading body is treated as a single individual, aiming to maximise its utility and subject to an ultimately diminishing final degree of utility as it consumes more of any one commodity. Thirdly, each trading body is initially the sole possessor of a particular stock of commodity: one has beef and the other corn.

Within each class of commodity, individual units are homogeneous and therefore subject to the '*Law of Indifference*, meaning that, when two

objects or commodities are subject to no important difference as regards the purpose in view, they will either of them be taken . . . with perfect indifference by a purchaser' (p. 92, Jevons's italics). This 'general law of the utmost importance' implies that 'the price of the same commodity must be uniform at any one moment' (ibid.).

Commodities are also infinitely divisible, which is 'approximately true of all ordinary trade, especially international trade between great industrial nations' (p. 120): note the attempted justification of the analysis by an appeal to aggregate behaviour.

Finally, there is an implicit assumption that utility functions are additive: the (final degree of) utility from beef, for example, is uniquely determined by the quantity of beef alone. (The complications introduced by 'equivalent' commodities – Jevons's omnibus term for substitutes and complements – were considered, but only briefly: pp. 134–7.)

Jevons proceeded to a description of post-trade equilibrium. Using his notation:

a = corn initially held by the first trading body;
x = corn traded;
b = beef initially held by the second trading body;
y = beef traded;
$\phi_1\ (a - x)$ = the final degree of utility of corn remaining to the first trading body after trade;
$\psi_1\, y$ = the final degree of utility of beef obtained by the first trading body;
$\psi_2(b–y)$ = the final degree of utility of beef remaining to the second trading body after trade;
$\phi_2 x$ = the final degree of utility of corn obtained by the second trading body.

The equilibrium position is:

$$\frac{\phi_1(a-x)}{F_1 y} = \frac{y}{x} = \frac{\phi_2 x}{\psi_2(b-y)} \qquad (1)$$

the celebrated 'equation of exchange', described by Allyn Young (1912) as Jevons's 'most substantial contribution to distinctly mathematical analysis'.

Following Blaug (1985, p. 310), the equation may seen more familiar to modern readers if unit prices are introduced (as they were by Jevons at a later stage: the exchange analysis was obviously anterior to price formation). Letting p_c and p_b stand for the unit prices of corn and beef respectively, substitution into the equilibrium condition for the first trading body yields:

$$\frac{\phi_1(a-x)}{\psi_1 y} = \frac{p_c}{p_b} \qquad (2)$$

And rearranging:

$$\frac{\phi_1(a-x)}{p_c} = \frac{\psi_1 y}{p_b} \qquad (3)$$

Final degrees of utility are proportional to unit prices.

One criticism of this analysis has been that Jevons failed to appreciate the indeterminacy of bilateral exchange. As Edgeworth remarked using his own terminology, the equation of exchange (i.e. (1) above) holds for *all* points along the 'contract curve' and the equilibrium allocation cannot be determined 'in the absence of arbitration' (Edgeworth 1881, p. 29). As a qualification, Jevons *did* provide a lucid discussion of indeterminacy and the need for arbitration, but only for the case of exchanging a perfectly divisible commodity with one that is indivisible (pp. 123–5).

More serious, some have contended, are the problems raised by 'trading bodies', which become acute when, in Jevon's demonstration of the 'real benefit derived from . . . exchange' (p. 142), one body is transmogrified into 'Australia', complete with single, smooth and continuous utility functions for two commodities (p. 144). Given the assumed shapes of these functions, 'Australia' gains total total utility from trade (Jevons had earlier disavowed any attempt to measure total utility) although whether this benefit carries over to real Australians is unclear if interpersonal comparisons of utility are taboo.

A window on Jevons's reasoning is provided by his discussion of the numerical estimation of 'laws of utility'. He would proceed by *first* gathering statistics of the 'quantities of commodities purchased by the whole population at various

prices' and *then* estimating the 'variation in the final degree of utility' (pp. 146–7). Taking the statistical 'demand function' as given, the transition to the utility function is made via the assumption of constancy in the final degree of utility for money (the utility from the increment of commodity purchased by, in Jevons's examples, one penny); granted this assumption as a 'first approximation' (p. 147), final degrees of utility will be directly proportional to prices.

Jevons may have thought that this procedure was legitimate because individual utility functions are not *directly* aggregated. But as we noted in section "Mathematics, Utilitarianism and Methodology", there is still the problem of reading back from 'quantitative effects' to feelings. Ironically, by making an *explicit* interpersonal comparison, Jevons recognised some difficulties himself.

His generalized comparison was that the final degree of utility of money to poor families exceeds that to richer ones (pp. 140–1) and is prone to *change* when items of expenditure vary in price (p. 148). Hence his admission that there is a 'great difficulty' in the way of interpreting aggregate data stemming from 'vast differences in the condition of persons', to which he added that the difficulty is compounded by 'the complicated ways in which one commodity replaces or serves instead of another' (ibid.). On his own terms he had therefore exploded the implicit claim that multi-person trading bodies were meaningful entities.

The Theory of Labour and Exchange-with-Production

The fifth chapter of the *Theory* is best known for the treatment of labour-supply, considered by Blaug to have been Jevons's 'most important contribution to the main stream of neoclassical economics' (1985, p. 313): a putative contribution which, however, has rather eclipsed an interesting discussion of production.

Taking the labour supply analysis first, Jevons's 'symbolic statement' (pp. 174–7) used the following notation:

t = duration of labour in clock-time;

x = commodity produced by an *independent* labourer (pp. 173, 176);

l = labour, conceived as *'painful exertion of mind or body undergone partly or wholly with a view to future good'* (p. 168, Jevons's italics); it was one of Jevons's 'ultimate laws' that labour eventually becomes increasingly painful as t is extended; and further note his conception of a *change* in l as that resulting from a change in an arbitrarily chosen interval of t, which allowed him to switch between what might be called an 'objective' rate of production ($\mathrm{d}x|\mathrm{d}t$) and a 'subjective' one ($\mathrm{d}x|\mathrm{d}l$);

u = utility derived by the labourer from the consumption of x or the commodities obtained in exchange for x; from the 'law' of diminishing final degree of utility this was taken to be a diminishing function of x.

With the 'reward to labour' given by $\mathrm{d}x/\mathrm{d}t \cdot \mathrm{d}u/\mathrm{d}x$, work continues until $(-)\mathrm{d}l/\mathrm{d}t + \mathrm{d}x/\mathrm{d}t \cdot \mathrm{d}u/\mathrm{d}x = 0$, described as the *'final equivalence of labour and utility'* (p. 177, Jevons's italics): work ceases when the utility obtained (directly or indirectly) from the commodity produced by an increment of labour equals the pain (disutility) incurred by supplying that labour. The analysis assumes that labour supply is continuously variable and can stop at any moment, which Jevons acknowledged was unlikely when labourers are not self-employed (p. 181).

Having considered the supply of labour to a single production activity, Jevons extended the analysis to the case of a utility maximizing individual capable of producing two commodities, x and y. With $u_i (i = 1, 2)$ denoting the utility obtained from $x (i = 1)$ and $y (i = 2)$, the optimal distribution of labour is given by:

$$\frac{\mathrm{d}u_1}{\mathrm{d}x} \cdot \frac{\mathrm{d}x}{\mathrm{d}l_1} = \frac{\mathrm{d}u_2}{\mathrm{d}y} \cdot \frac{\mathrm{d}y}{\mathrm{d}l_2} \tag{4}$$

The 'increments of utility from the several employments' are equal (p. 184).

This brings us to the often neglected demonstration that 'the ratio of exchange of commodities will conform in the long run to the *ratio of*

productiveness' (p. 186, Jevons's italics). It was assumed that production is still carried out by a single unassisted labourer and (implicitly) that time periods of production are uniform. for d*x*/d*l*, described as the (subjective) 'rate of production', Jevons substituted the symbol ω and for d*u*/d*x* and d*u*/d*y* he wrote, respectively, ϕx and ψy. Equation (4) then becomes:

$$\phi x \omega_1 = \psi y \omega_2. \tag{5}$$

The individual engages in exchange, gaining x_1, by giving up y_1. The 'equation of production' (5) is therefore modified, becoming $\phi(x+x_1) \cdot \omega_1 = \psi(y-y_1) \cdot \omega_2$, which, rearranged. gives:

$$\frac{\phi(x + x_1)}{\psi(y - y_1) = \omega_2/\omega_1}. \tag{6}$$

But from the equation of exchange [(10 in section "The Theory of Exchange"], the left-hand side of (6) is equal to y_1/x_1; hence ω_2/ω_1; 'we have proved that commodities will exchange in any market in the ratio of the quantities produced by the same quantity of labour' (p. 187).

Jevons had demonstrated that under certain circumstances, a 'pure' labour theory of exchange ratios and his own 'subjective' theory of exchange could be harmonized (cf. Wicksteed). He also argued that under the 'general rule' of joint-production (p. 198) it becomes 'impossible to divide up the labour and say that so much is expended on producing [one joint-product] and so much on [the other(s)]' (p. 200); this showed 'all the more impressively' that it is 'demand and supply' which governs ratios of exchange and not 'ratios of productiveness' (p. 199). (Later work has shown that by solving a set of simultaneous equations it is possible to 'divide up the labour', although some of the imputed labour inputs may turn out to be negative.)

Finally, we must consider the contentious issue of whether Jevons's analysis supports the attribution to him of a 'marginal productivity' treatment of labour's reward. Schumpeter, for one, thought it did (1954, p. 940). But Jevons's analysis applies to a 'free labourer' (p. 176): one who is free, seemingly, from employer, 'capital' and land. Before concluding that he meaningfully applied marginal productivity analysis to labour we must await the introduction of other 'requisites of production'.

The Theory of Rent

The theory of (differential) rent, adopted and translated into calculus in the sixth chapter of the *Theory of Political Economy*, was credited to James Anderson (1777) and had been widely accepted since the time of Malthus and Ricardo. Jevons considered the 'intensive' case (more intensive working of the same plot of land) and the 'extensive' one (the cultivation of separate plots differing in their yield). Commentators have taken greater notice not of Jevons's treatment of rent *per se* but of the evidence it provides for a grasp of 'marginal productivity' analysis in relation to labour.

Let us take Jevons's treatment of the intensive case. Output from a plot of land is a function of 'labour' and is subject to eventually diminishing returns. When production stops the recompense is given by the (utility from) the produce obtained by the incremental input. But with all *previous* applications of 'labour' recompensed at the same rate – deduced from the 'law of indifference' – there arises a 'surplus', differential rent, because the previous applications were, by assumption, more productive.

According to the analysis, rent is not an element of cost-of-production, which agrees with the position of Ricardo and others. However, in his preface to the *Theory* (2nd edition) Jevons argued that this was not generally so: if land has alternative uses, the (differential) rent yielded in 'the most profitable employment' must be 'debited against the expenses of . . . production' in other employments (p. xlix).

On the 'marginal productivity' issue, there is only a specious application of the analysis to labour: noting Jevons's assumption that 'increments of labour . . . are equally assisted by capital' (p. 216), the marginal product of 'labour' is actually the joint marginal product of labour-and-capital; consequently, 'the separate elements of wages and interest become indeterminate'

(Stigler 1941, p. 21). We have yet to encounter a precise (or intentional) account from Jevons of wage determination in a context of multiple 'elements of production'.

The Theory of Capital and Interest

Jevons's treatment of capital and interest – in Chapter 7 of the *Theory* – is often described as anticipating later 'Austrian' theory, particularly the variant developed by E. von Bohm-Bawerk. Commentators have therefore tended to praise or criticize according to their attitude towards the latter. However, even the favourably disposed have contended that there are weaknesses in Jevons's account.

'Capital' in its 'free' or 'uninvested' form is the *'aggregate of those commodities which are required for sustaining labourers of any kind or class engaged in work'* (p. 223, Jevons's italics). This is a 'real' conception but for purposes of aggregation Jevons used the 'transitory form of money' (p. 243), i.e. the monetary value of (aggregate) real wages.

Capital allows us to *'expend labour in advance'* (p. 226, Jevons's italics). It is therefore inextricably linked with time, its 'fixedness' depending on the relative time elapsing before the produce of 'supported' labour 'has returned profit, equivalent to the first cost, with interest' (p. 243). (The similarity between these views and Ricardo's was not lost on Jevons: pp. 222, 242.)

Jevons's general message was this:

> whatever improvements in the supply of commodities [which reduce the amount of 'painful labour'] lengthen the average interval between the moment when labour is exerted and its ultimate result or purpose accomplished, such improvements depend upon the use of capital (pp. 228–9, Jevons's italics).

But note that, for Jevons, 'improvements' always seem to involve a lengthening of the production process: a presumption which has been strongly criticised (see, for example, Stigler 1941, p. 26).

In Jevons's examples, the cost of things in which capital is fixed is supposed to be repaid over their lifetimes. How is this cost calculated? Here, Jevons distinguished between the *amount of capital invested* (ACI) and the *amount of investment of capital* (AIC): the former is a quantity of free' capital and the latter is the product of the ACI and the time for which it remains invested. Letting $t =$ the total time of investment and $w =$ ACI, Jevons's formula is: $AIC = w \cdot \frac{1}{2}t$ (p. 236): it is this which must be repaid, with interest.

Providing only *simple* interest is involved, $\frac{1}{2}t$ for a given production technique – the average time of investment – only depends on the physical conditions of production and is therefore independent of income distribution; consequently, the simple interest rate can be expressed in terms of the average investment time. These results do not hold with *compound* interest (see, for instance, Steedman 1972). In fact, Jevons seems to have recognised that his formula for the AIC would not hold with compound interest (p. 236) and that it is compound interst which is relevant (pp. 238–41). But the theoretical implications were not obviously comprehended.

We now consider Jevons's 'general expression for the rate of interest yielded by capital in any employment' (p. 245) which was clearly believed to have global relevance. Jevons assumed that 'the produce for the same amount of labour . . . [varies] as some continuous function of the time elapsing between the expenditure of the labour and the enjoyment of the result' (ibid). With t standing for time and Ft denoting produce at a point in time, the (instantaneous) interest rate is 'determined' by the ratio of an increment of produce $[F(t + \Delta t)]$ to the incremental AIC (which in this case is $\Delta t \cdot Ft$). In the limit, it is given by $F't|Ft$: '*the rate of increase of the produce divided by the whole produce'* (p. 246, Jevons's italics). Here, if nowhere else, there was an explicit and substantive application of marginal productivity analysis (but note that it pertained to the productivity of the ACI, or 'capitalization', and not capital *per se*).

Jevons thought his 'expression' could explain both the 'interest yielded by capital in any employment' and the (presumed) secular decline in the economy-wide interest rate: for each production process and in the aggregate, $F't|Ft$ 'must rapidly approach to zero, unless means can be found of continually maintaining the rate of

increase' (p. 246, pp. 253–6). The analysis raises some knotty questions.

If, in the derivation of the 'expression', we credit Jevons with making the tacit assumption that *ft* and *F't* are physically homogeneous, has reasoning *for that special case* was logically sound. But if he had in mind an example such as maturing wine, *Ft* and *F't* are, *according to his own analysis* (pp. 238–9), value magnitudes, *dependent* on the (compounded) interest rate for their calculation. Whenever we step outside the ('as if') one commodity world and introduce compound interest, Jevons's 'expression' will fail: by no stretch of the imagination is it 'general'. (In fact, the restrictions have been shown to be even more severe: see Steedman 1972). When one considers the further difficulties involved in aggregating diverse production processes – not discussed by Jevons – the retrospective conclusion must be that his analysis was more productive of problems than of solutions. Needless to say, any expectation that Jevons *should* have spotted and resolved all these problems would be Iudicrous.

Distribution and Value: Further Considerations

Jevons's views on distribution and value merit further comment: it was above all in these (interrelated) areas that he believed himself to have radically departed from 'classical' teaching: a judgement widely shared.

On wages, he was scathing towards 'wage-fund theory' and 'natural wage doctrine'. The former, interpreted as the proposition that 'the average rate of wages is found by dividing the whole amount appropriated to the payment of wages by the number of those between whom it is divided', is dismissed in the Preface to the *Theory* (first edition) for being 'purely delusive' and 'a mere truism' (p. vi). As for 'natural wage doctrine', he inveighted against Ricardo's 'sweeping simplification' of 'a natural ordinary rate of wages for common labour … [with] all higher rates … merely exceptional circumstances, to be explained away on other grounds' (pp. 269–70). But whether he transcended these 'erroneous' views is questionable.

In the concluding chapter of the *Theory*, it emerges that wage-fund theory does have 'a certain limited and truthful application' (p. 268). when new business ventures are undertaken: the 'amount of capital which will be appropriated to the payment of wages … will depend upon the amount of anticipated profits … All workmen competent at the moment to be employed will be hired, and high wages paid if necessary' (p. 272).

What of the 'long-run' position? Supposing the new venture is successful, 'those who are first in the field make large profits' inducing other capitalists to enter the fray 'who, in trying to obtain good workmen, will [further] raise the rate of wages' (p. 271). Ultimately, 'only the market rate of interest is obtained for the capital invested … [and] wages will have been so raised that the workmen reap the whole excess of produce, *unless … the price of the produce has fallen'* (ibid., italics added). Whether *that* happens depends on the kind of labour involved, because 'the rate of wages … of every species of labour will reduced to *the average proper to labour of that degree of skill'* (p. 272, italics added); so, if labour is skilled and educated, wages and therefore the 'price of produce' will remain high, whereas 'if only common labour' is required both will fall (p. 271).

Jevons had presented a 'wage-fund' explanation for the (entrepreneurial) 'short-run' and an explanation of 'long-run' wages that is hard to distinguish from 'natural wage' doctrine (especially in its Smithian form, where the 'natural' wage for 'common labour' is merely the current 'centre of gravity' and not necessarily a minimum 'subsistence' wage). The impression that he had done otherwise can probably be traced to ideas presented in his Theories of Labour and Rent which, if coupled with his statement that *'wages are clearly the effect not the cause of the value of the produce'* (p. 1, Jevons's italics; cf. p. 165), may seem to point towards an 'imputational' kind of 'marginal productivity' analysis. However, as shown in sections "The Theory of Labour and Exchange-with-Production" and "The Theory of Rent", the

evidence to this effect from his Theories of Labour and Rent is suspect, and regarding the 'causal' claim, the argument documented in our previous paragraph implies an *interdependency* between wages and the 'value of produce'. The latter point is particularly relevant for an appreciation of Jevons's value analysis.

Jevons complained about 'the thoroughly ambiguous and unscientific character of the term *value'* (p. 76, Jevons's italics) but after promising to 'discontinue the use of the word' (p. 81) he used it all the same, mainly in the sense of *exchange-value*, i.e. ratio(s) of exchange. He was keen to contrast his own opinion – *'value depends entirely upon utility'* (p. 1, Jevons's italics) with the (Ricardian) doctrine that 'value will be proportional to labour', which, he claimed, 'cannot stand for a moment, being directly opposed to facts' (p. 163). Four arguments were deployed.

First, as Ricardo had admitted, some commodities are not reproducible and so the 'labour theory' cannot apply to them. Secondly, again as Ricardo had allowed, market exchange ratios fluctuate around those given by comparative amounts of labour expended in production. Thirdly, '*labour once spent has no influence on the future value of any article*: it is gone and lost for ever' (p. 164, Jevons's italics). And fourthly, Jevons objected to Ricardo's 'violent assumption' of homogeneous labour (p. 165).

The first of these arguments is true and need not detain us. The second would equally apply to Jevons's 'equation of exchange' (above, section "The Theory of Exchange") and is well answered by Jevons himself: 'We shall never have a Science of Economics unless we learn to discern the operation of law even among the most perplexing complications and apparent interruptions' (p. 111). Moving to the fourth argument and supposing that Ricardo *had* assumed homogeneous labour, this does not seem any less 'violent' than Jevons's preferred assumption of a *single labourer* (above, section "The Theory of Labour and Exchange-with-Production").

That leaves the third argument, which Jevons clouded with his incisive demonstration that long-run values *might* conform to 'ratios of productiveness' (above, section "The Theory of Labour and Exchange-with-Production"). Ironically, the limitation that he chose not to highlight – stemming from joint-production – has recently been shown to create severe difficulties for deterministic labour theories (Steedman 1977).

As for the claim about value depending 'entirely on utility'. savaged by Marshall (1920, pp. 673–5), in the light of the whole *Theory of Political Economy* it did not accurately convey Jevons's position. For example, when a 'pure' labour theory holds, the 'ratio of exchange [value] governs the production as much as the production governs the ratio of exchange' (p. 188); in general it is the 'demand and supply of. . . products' which 'rules value' (p. 199); and as we discovered earlier, wages will also influence long-run values.

We are now positioned to integrate Jevons's theory of value and distribution. In the 'short-run' wages are determined by his own version of 'wage-fund theory'; the price of produce is determined by supply and demand; and profit comes out of the residual or 'surplus'. In 'long-run equilibrium', supply of output is so adjusted relative to demand that revenue just covers what we might as well call (*pace* Jevons) natural wages and the natural rate of interest on capital (the uniform interest rate to which individual rates tend pp. 244–5); and if production is land-using, it must also cover (natural) rent as 'determined by the excess of produce in the most profitable employment' (p. xlix). In the 'long-run', then, there is no class of income which can properly be described as a 'surplus'.

Conclusion: Jevons and His Classical Predecessors

Jevons accepted unreservedly both Malthusian-style population theory and the 'impossibility of general gluts' thesis (his strictures on gluts – pp. 202–3 – bear a close resemblance to Ricardo's). There was also a modified acceptance of differential rent theory with an allowance made for rent as an element of cost-of-production (a Smith-Ricardo 'meld'); and at least a 'family resemblance' between Jevons's treatment of

capital and Ricardo's. A further point which has emerged is that Jevons was concerned with *aggregate* behaviour: a simplistic 'micro'/'macro' distinction between Jevonian and 'classical' analysis cannot be sustained.

A major contrast, however, is that Jevons's analysis was predominantly *static*, not because he believed 'dynamic' issues were uninteresting, rather that 'it would surely be absurd to attempt the more difficult [dynamic] question when the more easy [static] one is yet so imperfectly in our power' (p. 93). Despite its 'truth and vast importance' (p. 266) population theory was therefore excluded from the (static) 'problem of Economics' which Jevons stated as the allocation of *given* resources so as to *'maximise the utility of produce'* (p. 267. Jevons's italics).

His theory of value and distribution also contrasts with 'classical' analysis, though not for all the cliched reasons. Jevons's treatment of both short and long-run wages could be described as 'classical' in substance. And in the long-run, *if* commodities sell at 'equilibrium' prices these can be decomposed into wages, interest and rent, all at their average (or 'natural') rates: to that extent, the analysis is reminiscent of Adam Smith's.

Where Jevons unambiguously and substantially departed from 'classical' teaching was with his 'marginal productivity' theory of 'capitalisation' and his application of (Bentham's) utility analysis to *all* aspects of economic behaviour, not just consumption-demand.

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Jevons, William Stanley (1835–1882)

Harro Maas

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Abstract

This article examines William Stanley Jevons's life and work against the background of Victorian disputes over the appropriate method of political economy. Jevons is commonly known as one of the founders of marginalist analysis in economics. As a genuine Victorian polymath, Jevons undertook research in many different fields of the sciences, meteorology, statistics and political economy in particular. This article shows how Jevons transposed his training in the natural sciences to political economy, in the process shifting from a labour to a utility theory of value and mathematizing the discipline as well.

Keywords

Bentham, J.; Boole, G.; Cairnes, J. E.; D'Avenant, C.; De Morgan, A.; Equation of exchange; Felicific calculus; Functional analysis; Hedonic theory of value; Index numbers; Induction; Jenkin, H. C. F.; Jevons, W. S.; King, G.; Labour supply; Labour theory of value; Marginal revolution; Mathematical methods in political economy; Mill, J. S.; Political economy; Productive and unproductive labour; Psychophysiology; Quantity theory of money; Quetelet, A.; Statistics, and economics; Tendency laws; Tooke, T.; Utility; Value; Wages fund; whewell, W.

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Stanley Jevons is generally known as one of the 'fathers' of the so-called marginal revolution in economics of the last decades of the 19th century. In his *Theory of Political Economy* (1871), with its 'mechanics of utility and self-interest', he analysed decisions of economic agents by means of the calculus, in terms of deliberations over marginal increments of utility. Economic agents – whether in their role as consumers, workmen or other – came to be seen as maximizing utility functions. Jevons is thus commonly considered to have broken with the labour theory of value of the classical economists. Value came to be identified with exchange value, and Jevons identified this with what we now call marginal utilities, not with costs of production. Jevons is also remembered for his innovative contributions to the empirical (statistical) study of the economy. He much favoured the use of graphs to picture and analyse statistical data. He introduced index numbers to make causal inferences about economic phenomena such as changes in the value of gold following the gold discoveries in California and Australia. In short, there is no particle of economics, theoretical or empirical, to which Jevons did not make important contributions that even in the 21st century are considered to have altered the field of economics in revolutionary fashion.

Though this short summary of Jevons's accomplishments makes him one of the fathers of modern economics, Jevons was in many regards heavily indebted to Victorian ways of practising the natural sciences. This transpires from his commitment to a Baconian view of the natural and social sciences and the typical Victorian use of mechanical analogies to understand the world. Just as William Thomson, the later Lord Kelvin, argued that the making of a mechanical model was the ultimate 'test' of intelligibility of a natural object, so Jevons relied on mechanical models to understand the social world. For Jevons, human individuals were little machines driven by pleasures and pains; they were not rational and autonomous decision-makers. In his influential essay on the nature of political economy (first edition 1932) Lord Robbins perceived clearly that Jevons's analysis was not just rooted in Bentham's hedonics, but in psycho-physiological explanations of human conduct. Jevons's new theory of value was not a theory of rational choice. The common perception of Jevons's utility theory as a theory about individual *decision-making* is therefore not quite accurate.

This article, in following Jevons's life and work, aims to show how Jevons translated his knowledge of methods of research in the natural sciences to political economy and thus to radically transform the scientific image of economics. The radicalism of Jevons's new approach to political economy will be better understood against the background of Victorian discussions of its proper method.

Early Years

Stanley Jevons was born in Liverpool as the ninth child in a well-to-do Unitarian family. In 1882 he drowned near Hastings at the age of only 47, leaving his wife Harriet Taylor and three children. Good biographical essays are Black and Könekamp's introduction to the papers and correspondence (1972–81), Schabas's 1990 monograph, and Mosselman and White's introduction to their recent edition of Jevons's major works. The liveliest introduction to his biography is still to be gathered from his own *Letters and Journals* (1886), chosen from his *Nachlass* by his wife Harriet.

Jevons's father, Thomas Jevons, was an iron merchant with utilitarian sympathies who is said to have invented the first floating iron ship. His mother, Mary-Ann Roscoe, was the daughter of William Roscoe, a Liverpool banker and important collector of Flemish and Italian masters. Like the Booth, Hutton and Martineau families to whom they were related, the family formed part of the selfconfident Unitarian circles in the heartland of the industrial revolution that shared a belief in rational argument and the advancement of science to promote the common good. It is therefore unsurprising that Jevons's early

education was predominantly in the natural sciences, first at Liverpool Mechanics' High School, and, after an interlude at a grammar school that was less to his liking, at the preparatory school of University College London. In 1851 he enrolled at University College itself to study mathematics and chemistry.

Jevons's youth was not without difficulty. His mother died in 1845, his much beloved eldest brother, Roscoe, went insane in 1847; on top of this, his father's iron business went bankrupt in 1848 due to the great railway crisis the previous year. Forced to move to Manchester, the Jevons family never recovered from these financial difficulties, which lifted Stanley and his siblings from the commercial elite to what has been called the 'uneasy classes' – intellectually gifted, but without the means to leisurely pursue their interests. As we will see, the family's financial difficulties greatly influenced Jevons's early intellectual career.

At University College, Jevons enrolled in courses in experimental philosophy and chemistry, and the mathematics class of Augustus De Morgan, the first mathematics professor at University College who taught the by far most demanding course in mathematics in England at the time. De Morgan was a great propagator of French analysis, a mathematics that by 1850 was still received with considerable scepticism in the Oxbridge system because of the strong mechanical worldview that went with it. De Morgan would prove to be one of the most enduring influences on Jevons's intellectual life. Though Jevons performed well, he never considered himself a mathematician (and was not so considered in his lifetime). Jevons's forte was in chemistry and the experimental sciences.

During these first years of study Jevons won several medals, a gold medal in chemistry amongst others. In 1853, through the intervention of his cousin Harry Roscoe, the later professor of chemistry at Owens College, Manchester, Jevons was offered the opportunity to become gold assayer at the newly established Mint in Sydney. After some hesitation (and persuasion by his father) Jevons accepted the offer, because the job paid extremely well (£675 a year), and thus helped to alleviate the financial burdens on the family. Jevons sailed off to Australia in 1854 to stay there for a five-year period.

Jevons's Antipodean Interlude

There has been quite some discussion about the importance of Jevons's 'Antipodean interlude' for his further intellectual career (see the relevant essays in Wood 1988). Not only did the work at the Sydney Mint offer Jevons ample opportunities to pursue his manifold scientific interests, but the social environment of the Mint itself was highly favourable to the pursuit of science. The newly created philosophic society of New South Wales, of which Captain E.W. Ward, director of the Mint, was office bearer, provided Jevons and his colleagues ample opportunities to develop their scientific interests and to publish on them. As a typical Victorian colonial institute the Mint thus functioned as a nucleus of scientific activity that turned its 'imperial gaze' upon Australian nature and society.

The most important Australian science periodical was the *Sydney Magazine of Arts and Sciences,* to which Jevons made several contributions, most of them on meteorology. Jevons published on experiments on the formation of clouds, in which he attempted to reproduce clouds on a miniature scale in accordance with the existing classification of clouds. He made these experiments on strong mechanical assumptions and in the hope of rendering his results in mathematical form – something that proved far too difficult. His aim was to mimic the process of cloud formation in another medium (fluid rather than air) and so to uncover its underlying mechanism. It is worth noting that Jevons's experiments did not go completely unnoticed: Lord Rayleigh, the later Nobel laureate in physics, reproduced Jevons's experiments in the early 1880s at the Cavendish laboratory at Cambridge in order to study diffusion processes in fluids and gases. Jevons also contributed to Waugh's statistical almanac, in which he extensively reported on his statistical observations on the Australian weather. Jevons's cloud experiments and his work in

meteorology are best covered by Raymond Schmitt (1995) and Neville Nicholls (1998).

In the 1830s Lancashire Unitarians had been instrumental in setting up statistical societies to study the 'moral and physical condition of the working classes'. In a similar vein Jevons had wandered through the poor working men's districts of London – the 'dark alleyways of Spitalfields' – to study the moral condition of the working poor during his early years of study in London. In Australia Jevons resumed these wanderings and started work on a social survey of Sydney. He published on his findings in the *Sydney Morning Herald.* Though only fragments of the original survey remain, it is clear from his notebooks that Jevons considered his survey the beginning of a 'science of towns' that itself was a prelude to a general 'science of man'. A very good recent study of Jevons's survey (Davison, 1997–8) has shown interesting parallels with the much better-known work of Henry Mayhew on the London poor and Charles Booth's famous late 19th-century social survey of London. Jevons's social survey may serve as early witness of how he transported his natural and acquired skills in decomposition and classification of natural phenomena to the social sciences, and how he translated visualizing techniques used in the natural sciences to the social domain.

Another fine example, from the same Sydney period, of Jevons's use of visualizing techniques to classify social phenomena, recently explored by White (2006), is his stratigraph of the 'industrial system of society'. Jevons classified the various occupations of Australian society in different layers corresponding to a system of human needs and to the classical distinction between productive and unproductive labour. This kind of diagram had only recently come to be used by geologists to picture the composition of the underground. It is noteworthy that the subtitle of Jevons's last great work (or rather project), the unfinished and posthumously published *Principles of Political Economy*, shows his lifelong concern with the 'industrial mechanism of society'.

Jevons not only explored the urban wilderness of Sydney but also made excursions into New South Wales, for example to the newly discovered gold mines. Sometimes he made these trips alone, because others found them too dangerous. The barometer and thermometer always accompanied him, and his notebooks are filled with pages of meteorological observations made during these trips. Apart from his extensive and innovative use of visualizing techniques, his appetite for the experimental method in the sciences, and his sometimes daring and innovative collection and analysis of statistical facts, Jevons also pioneered in photography, which was facilitated by his knowledge of chemistry and the ease with which he could lay hands on chemical materials equally needed in photography and goldassaying. In 2004 the Sydney Powerhouse Museum organized an exhibition on Jevons's life and work in Australia that wonderfully brought all these different influences and materials together, thus showing vividly the rich background and context of Jevons's scientific work. For a brief description of this exhibition see Barrett and Connell (2005).

Historians of economics have commonly taken Jevons's enthusiasm for a lecture on Bentham's utilitarian ethics as a decisive moment in his turn to the social sciences and to political economy in particular. Jevons's appraisal of this lecture is seen as a premonition of the hedonic theory of value that was to become the core of his *Theory of Political Economy* (1871). In addition to this, reference is often made to the interest Jevons took in the Australian railway debate (to which he made some contributions in the *Empire*, an Australian newspaper) and his interest in Lardner's *Railway Economy,* a book that was influenced by the work of Cournot on oligopolies. From the above it should be clear that Jevons's studies in social statistics and political economy were wide in scope. From a very young age he aimed at allembracing explanations of society that were deeply rooted in a thorough engagement with statistics and fuelled by a predilection for mechanistic explanations.

This short summary of Jevons's scientific pursuits in Australia shows him to be the kind of Victorian that felt more indebted to the Belgian astronomer and revolutionary of statistics Adolphe Quetelet than to John Stuart Mill or August Comte. In a short essay on Comte for

Nature (1875), Jevons explicitly paid tribute to Quetelet as the 'true founder' of the social sciences, because of his endeavours to discover, like an astronomer, regularities in the avalanche of social statistics. According to Jevons, by focusing on average values, rather than on particular data, the mechanisms could be uncovered that governed the natural and the social world. Mathematics, when properly targeted, spelled out this mechanism. When Jevons wrote from Australia to his sister Henrietta that he considered devoting his life to political economy it was not so much an application of Bentham's hedonic calculus to economics he had in mind, but rather his aim to explain the 'industrial mechanism' of society. The consequences of Jevons's attitude to science for political economy would become spelled out only after his return to London to take up his studies at University College, London.

The Mid-Century Split Between Theory and Statistics

Jevons returned to England in 1859. He once again enrolled at University College, now to study political economy, but he quickly became disappointed in the way the topic was taught by Jacob Waley, whom he considered 'prejudiced' against opinions and ideas that went contrary to the Mill–Ricardian orthodoxy. As in the early 1850s, Jevons most enjoyed his mathematics classes with Augustus De Morgan. Jevons completed his BA in 1861 and received his MA in 1863.

Jevons's disappointment was not just a matter of (emerging) diverging insights about one of the cornerstones of classical economics, the theory of value; it was also disappointment with its methods of research. Mid-century political economy was characterized by a sharp split between economic theory and statistics. In his writings on the definition and method of political economy, J.S. Mill (and in his footsteps John Elliot Cairnes) had ardently defended the so-called deductive or a priori method of political economy in opposition to the inductive (statistical) method. Mill had done so in his seminal essay of 1836 'On the Definition of Political Economy; and on the Method of Investigation Proper To It' that was reprinted in his *Essays on Some Unsettled Questions of Political Economy* (1844) and in the famous Book VI of *Logic* (1843) that was devoted to the method of the 'moral sciences'.

Mill wrote his essay in a deliberate defence of Ricardian economics, which in the early 1830s was actually on the wane. Mill was adamant there was nothing wrong with Ricardian economics. Indeed, what was considered its most distinguishing 'vice' – its deductivism – was just the way the science should proceed. Mill's argument for this was quite innovative and had little to do with Ricardian theory per se. Leaning on the philosopher of mind Dugald Stewart, Mill sharply distinguished between two different fields of science, the natural and the mental (or 'moral', as was used somewhat equivalently at the time). Political economy was interested only in a limited set of mental motives on whichobservations could be made within the 'private laboratory' of one's own mind. Therefore, political economy was a science of *tendency laws* the consequences of which could be deduced with the same certainty as the laws of physics. Mill repeatedly emphasized that what we nowadays call 'introspective' observations on mental states were as good as the methods of 'observation and experiment' used in the natural sciences. Mill's defence of (Ricardian) political economy proved extremely successful. After the publication of his own *Principles of Political Economy* (1848) debates on the proper method of political economy certainly shifted in favour of Mill.

Following Mill, the Irish political economist John Elliot Cairnes argued in his lectures on the method of political economy (1857) that a political economist did not need the 'tedious route of induction' practised by the statistical societies. Political economy was an a priori science and the 'business' of the political economist was finished once he had traced an event back to a mental motive. More explicitly than Mill, Cairnes argued that political economy lacked the exactness of the natural sciences, because principles of the mind, by their nature, were not the kind of material fit for measurement and hence quantification. Cairnes's lectures reflect the 'curious separation between

abstract theory and empirical work' in which the work of political economists and statisticians were worlds apart (Blaug 1976), much in contrast with Jevons's own practice in Australia.

Much of Jevons's mature work in economics and statistics can be seen as a deliberate transgression of this division between (inductive) statistics and (deductive) theory. In his 1870 opening address as president of Section F of the British Association for the Advancement of Science (BAAS), Jevons explicitly argued that a 'scientific treatment' of social facts consisted in inductive and deductive processes, just as in the 'other branches of the sciences'. Jevons used his mechanical world view to cut through the distinction between theory and statistics and in the process mathematized the discipline.

Jevons's Publications in the 1860s

In the early 1860s Jevons worked in frenzy on a variety of subjects. He devoted much of his time to the development of an alternative to George Boole's algebraic logic, on which he published a small tract in 1863 that received little attention. He worked on what he called his 'Statistical Atlas' project, a large-scale project clearly started in the spirit of William Playfair's *Commercial and Political Atlas* (1801), which was the first application of the graphical method to social statistics. He presented its outline and first plates to William Newmarch, then one of the leading statisticians, but Newmarch hardly paid attention to it, and Jevons ended up publishing two of his plates at his own expense. He wrote several entries for Watts's *Dictionary of Chemistry and of the Allied Branches of the Other Sciences* (1863–8) on various measuring instruments, such as the balance and the thermometer, but also on topics such as cloud formation. He wrote a short outline of a mathematical theory of political economy, read to the British Association for the Advancement of Science in 1862 and published 1866 as the *Brief Account of a Mathematical Theory of Political Economy.* It was as poorly noticed as his work in formal logic, and it is understandable that Jevons's diary at the end of 1862 showed some frustration about his worldly accomplishments. The best essay on Jevons's first brief mathematical outline of economics is by Grattan-Guinness (2002).

Jevons's first success came with his study of the fall of the value of gold, published in 1863, and republished in his *Investigations in Currency and Finance* (1884). Apart from giving an imaginative survey of the various causes of price fluctuations, it is noteworthy for the use of index numbers to assess the change in the value of gold. The question was whether the value of gold had changed as a result of the gold discoveries in California and Australia. The study can be seen as an application of a version of the quantity theory of money, but, more interestingly, Jevons compared the quantity theory equation of exchange with a mechanical balance and asked what was the more probable: that a tip of the balance had come from a variety of causes influencing individual prices on the one side of the balance, or from just one cause on the other side, that is, an increase in gold bullion. On this analogical reasoning Jevons constructed an unweighted index number, arguing that the geometric mean gave the best approximation for the 'true' fall in value (and so a rise in the general price level). Whatever its technical limitations (many of which Jevons acknowledged himself), the study was a genuine accomplishment and it was immediately recognized as such. It was well received by Cairnes, who wrote approvingly that he had come to similar conclusions though using the a priori method of research; for Cairnes, statistical data did not play any formative role in his argument.

The favourable reception of Jevons's essay on the value in the fall of gold of 1863 was even surpassed by that of *The Coal Question* in 1865. This soon made Jevons's professional frustrations vanish. Already elected a member of the London Statistical Society in November 1864, by 1865 Jevons could notice in his diary that he was considered 'by reviews of authority, a *competent* statistician'. *The Coal Question* was Jevons's definitive breakthrough. Using extensive statistical resources, the book addressed the question of England's wealth in the face of the inevitably rising costs of coal extraction. It is still excellent

reading for those interested in environmental economics. It led J.S. Mill to ask questions in Parliament and Gladstone to invite the author to Downing Street (and to argue for a balanced budget). *The Coal Question* was certainly instrumental to Jevons's appointment as professor of logic and political economy at Owens College, Manchester in 1865. For someone who had just reached the age of 30, this can hardly be seen as an unfavourable professional record.

In the second half of the 1860s Jevons continued to publish in statistics and formal logic, on the development of his logical machine in particular. He presented his own formal logical system in *The Substitution of Similars* (1869) and his proposal for a mechanical representation of this system in *The Mechanical Performance of Logical Inference* (1870), both reprinted in *Pure Logic and Other Minor Works* (1890). He also published statistical investigations on seasonal variations, using ratio charts to thresh out seasonal patterns. At the end of the 1860s, Jevons was predominantly known for his work in formal logic and statistics, not as a theoretician, and it may be for that reason that political economists such as Mill and Cairnes were somewhat puzzled by the *Theory.* Given their views on the method of political economy, they substantially disagreed with Jevons's transgression of the dividing line between the natural and moral sciences, and with his concomitant use of formal methods in political economy. Jevons gave his general defence of a unified scientific method in his major work, *The Principles of Science*, published in 1874.

Formal Logic and the Mechanics of the Mind

To understand the impact of the emergence of formal logic in Britain, pioneered by Boole, De Morgan and Jevons, it is important to invoke the distinction between the moral (or mental) and natural realm that dominated Victorian discourse from the publication of Mill's *Logic* onwards. Quantitative methods of research – mathematics and statistics – were considered fit for the natural realm, but the realm of the mind could (and should) be explored introspectively. Logic, until then, was considered a branch of the sciences of mind, not of the natural sciences, and so the idea of using mathematics for its study was considered a violation of the distinction between these realms (Richards 2002).

Earlier in the 19th century Babbage's famous calculating engines had opened up debates in which the idea was explored that our mind was, after all, no more than a calculating machine. Challenging the distinction between mind and matter, such thoughts (and machines) also challenged one of the backbones of Victorian moral philosophy, the notion of freewill. A variety of authors who agreed on next to nothing found themselves in the same camp on this issue: William Whewell, J.S. Mill, the utilitarian philosopher James Martineau and the common sense philosophers William Hamilton and Henry Longueville Mansel all argued against the use and usefulness of algebraic methods for the study of logic, precisely because this was felt to threaten the notion of free will, and more generally the foundations of moral agency.

Augustus De Morgan clearly was of opposite opinion. In his writing on Boole's algebraic logic and in his own formal logic, he emphasized the connections between an algebraic treatment of logic and mechanical theories of the working of the mind. In his own work in formal logic, Jevons followed De Morgan's lead. Jevons enthusiastically referred to Boole and Babbage and promised a logical machine of his own 'which shall not only solve Aristotle's dilemma's, but shall exhibit to the eyes the working of Boole's logic the most general and perfect system of logic yet proposed'. Jevons worked on such a machine in the mid-1860s and wrote several articles to describe its working. To emphasize the relation between the machine, formal logic, and the method of science, he used an image of the machine as a frontispiece to his own magnum opus on scientific method, *The Principles of Science* (1874). Jevons once described this book to his brother Herbert as a work on formal logic 'in disguise'.

It is worthwhile quoting from De Morgan's *Formal Logic* (1847) and Jevons's *The Principles of Science* (1874) to see the similarities between

their endeavours. De Morgan wrote that 'with respect to the mind, considered as a complicated apparatus, we are not even so well off as those would be who had to examine and decide upon the mechanism of a watch, merely by observation of the function of the hands, without being allowed to see the inside'. Jevons similarly wrote that 'we are in the position of spectators who witness the productions of a complicated apparatus, but are not allowed to examine its intimate structure'. These extracts show not only their similarities, but, more importantly, how Jevons's (and De Morgan's) reliance on mechanical analogies shifted the grounds for studying the laws of mind from an introspective to an outsider's perspective; the emergence of formal logic challenged introspection as a viable route of discovery in the realm of the mind.

So what alternatives did Jevons propose for discovery in the moral sciences? Essentially, his general answer was: statistics and mathematics; the specific answerwas: psychophysiology. The first answer related to Jevons's view that all sciences were quantitative in nature and that one needed proper instruments to measure these quantities. The second related to contemporary developments in the work of the physiologists William Carpenter, Henry Maudsley and others, work that seemed to promise the unravelling of the physiological groundwork of human agency. For Jevons these developments pointed in the direction of a mathematical theory of human agency, which was to be made exact with the help of statistics. I will first discuss the relation of Jevons's logical machine to his theory of induction and then discuss the relation of his reading into psychophysiology to his new theory of value.

Rethinking Induction

To see the relationship between Jevons's logical machine, statistics and induction we need a brief outline of the machine's working. The logical machine had the appearance of a small piano. Its keys were either terms in a logical proposition or operations like 'and', 'or', and 'is'. Though the machine was of limited capacity, Jevons used it as an illustration device of the more general process of logical inference. One of his examples was 'Iron is a metal', or in Jevons's formalism 'A = AB', and 'a metal is a good conductor of electricity', formally 'B = BC', an example that referred back to Hans Christian Oersted's famous thought experiment on the relation between electricity and magnetism. Once these propositions were fed to the machine, a tip on the 'finis' key made the machine 'reason upon' them. Thus, Jevons argued, just as Babbage had created 'in the wheels and levers of an insensible machine' a 'rival' of the human mind, so his logical machine 'really accomplishes in a purely mechanical manner ... the true process of logical inference'. All conclusions that could be drawn appeared on the display at the front of the piano (in the example given, there are eight valid conclusions). The list of conclusions would grow exponentially with the number of propositions.

At the time, the fact that the machine showed *all* logical conclusions was seen as a disadvantage. Jevons turned this disadvantage into a clue about induction. He believed that observations should be considered as the conclusions poured out by the fundamental machinery of nature. The task of the scientist was to infer back from the avalanche of conclusions to the fundamental propositions underlying them –in the example given, the scientist should infer back from the eight conclusions to the two producing propositions or 'laws'. Jevons called this process 'indirect deductive inference'. When facing nature's complexity, such indirect deductive inferences could only be hypothetical; there was no unambiguous procedure to know with certainty that the correct fundamental propositions were touched upon.

If nature's conclusions were quantitative, then the fundamental laws were quantitative as well. Jevons gave an example that Babbage had discussed in his *Ninth Bridgewater Treatise,* Bernoulli numbers. Behind a seemingly capricious array of numbers there was a simple mathematical formula generating them all. Once one left the realm of pure mathematics and entered the real world, however, an additional complicating factor entered the scene that related to the process of scientific observation itself. According to

Jevons, all scientific observations were loaded with error, so the laws of nature could never fully account for individual observations, but should always relate to average values. Errors in measurement cancelled out in the average. For this reason Jevons never considered the target of scientific explanation a mathematical form fitting all individual observations; rather, science should find the 'rational formula', that is, the mathematical form that explained the phenomena behind the data. This is exactly the procedure Jevons followed in his own statistical investigations, and it put him at a large distance from Mill. As explained best by Sandra Peart (1995), Mill's 'disturbing causes' were for Jevons just 'noxious errors'. Jevons's investigations into the 'black art of induction' were thus closely connected to his investigations in formal logic and the logical machine. They gave a pivotal role to the manipulation of statistical data in discovering the underlying laws producing these data 'in the average'.

Mathematics and the 'Physiological Groundwork' of Economics

In the *Principles* Jevons illustrated his meaning with reference to a series of (self-) experiments on the relationship between work and fatigue, which he published in *Nature* (1870). Jevons made these experiments using proxies for physical labour (holding weights, lifting weights with pulley and block, throwing weights) to show how, contrary to the opinion of political economists like Mill and Cairnes, the investigation of the 'physical groundwork of economics' could be mathematized. Thus, these experiments form an interesting link between Jevons's views on the role of statistical data as evidence for theories, and his views on the nature of political economy.

In his lectures on the method of political economy, Cairnes had discussed two authors in particular who proposed to ground economics in the mechanics of man's physiology, Richard Jennings and Henry Dunning Macleod. Cairnes observed that 'every economist, so soon as an economic fact has been traced to a mental principle, considers the question solved', and so did not need to take recourse to a superfluous examination of mankind's physiology. These authors thus transgressed the limits Mill had set on political economy. Referring to Jennings's *Natural Elements of Political Economy* (1855) in particular, Cairnes argued that he could not see how an examination of the 'afferent trunk of nerve-fibre' would clarify, for example, the phenomenon of consumption. If political economy consisted in the study of man's physiology, Cairnes complained, 'it is evident that it will soon become a whole different study from that which the world has hitherto known it'.

Jevons read Cairnes's lectures intensely, but he did not approve of its conclusions. In contrast with Cairnes, Jevons enthusiastically embraced Jennings's suggestion to ground the laws of political economy in man's physiology. In the *Theory* Jevons wrote that Jennings 'most clearly appreciated the nature and the importance of the laws of utility' by treating the 'physical groundwork of Economy, showing its dependence on physiological laws'. While Cairnes dismissed Jennings's suggestion to 'exhibit' the 'result of the principles of human nature … by the different methods of Algebra and Fluxions', Jevons considered this 'a clear statement of the views which I have also adopted'.

In a series of excellent essays, Michael White has explored the relation of Jevons's *Theory* to his engagement with psychophysiology and his closely related interest in the emerging theory of thermodynamics (see in particular White 1994a, 2004; also Maas 2005). From White's investigations the following image emerges.

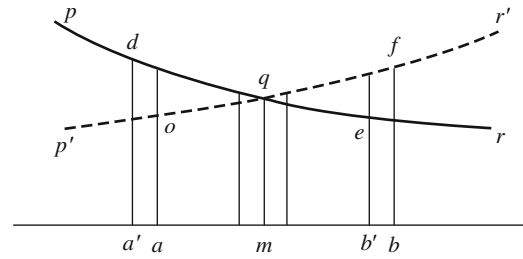
In his early years back in London, Jevons explored the meaning of value in economics using two resources, Bentham's felicific calculus of pleasures and pains, and contemporary research in psychophysiology, in particular the work of William Carpenter, which built on Marshall Hall's theory of reflex action of the 1830s. These investigations brought him to the idea that value, or what he later called the 'final degree of utility', could be examined by means of functional analysis. Jevons's own work on his highly successful *Coal Question* (1865) importantly contributed to his own awareness of the importance of the newly emerging discourse of thermodynamics. The

incorporation of the new discourse of energy already transpired from the *Theory* itself, in particular from his theory of labour supply, and is even clearer in his (unfinished) *Principles of Economics*.

In June 1860 Jevons famously wrote to his brother Herbert that he had found the decisive elements of his new theory of utility, especially 'the most important axiom' of the declining degree of what he then called the *'ratio of utility*', and the assumption that, 'on an average', this ratio of utility was 'some continuous mathematical function of the quantity of commodity'. According to Jevons, political economists had assumed this law 'under the more complex form and name of the Law of Supply and Demand'. Hence, Jevons's engagements with psychophysiology and his attempt to mathematize the theory of value were intimately connected. Psychophysiology made Jevons think of a mechanism of pleasures and pains, which expressed itself in market prices.

Jevons's first airing of his new mathematical theory of value was the short *Notice* of 1862 that was read to the BAAS and published in 1866 as the *Brief Account.* Though Jevons had been thinking about his theory throughout the 1860s, he felt prompted to write it down after William Thornton's challenge to the classical wages fund theory in 1867. Thornton's challenge led to Mill's famous recantation and to vehement debates as to the character of the 'laws of supply and demand'. Jevons's extensive exchange of letters with the engineer Fleeming Jenkin on this topic was the immediate reason to speed up publishing a written version of his mathematical theory of utility. When Jenkin published a paper in 1870 called the 'Graphical Representation of the Laws of Supply and Demand', Jevons clearly feared that priority in a mathematical theory would escape him, and in just half a year he completed the *Theory.*

This book seriously transgressed the limits set by Mill on political economy's methods and subject. In his *Essay* of 1836 Mill had relegated the *'laws* of the *consumption* of wealth' to outside the domain of political economy. Jevons, by contrast, made these 'laws of human enjoyment' the cornerstone of his new theory. To articulate these



Jevons, William Stanley (1835–1882), Fig. 1 (*Note*: Jevons's diagrammatic representation of the utility adjustments of an individual ('trading body') to the optimum at *m*, at given market prices of two Commodities *x* and *y.* The utility curve *p'r'* for commodity *y* is inverted and superposed upon the utility curve *pr* for commodity *x*. *Source*: Jevons 1871)

laws, Jevons used Bentham's felicific calculus, but he grounded this calculus in man's physiological dispositions. Rather than thinking of pleasures and pains as motives on which the mind decides, Jevons transformed them into physical forces that drive a mechanical balance to equilibrium. Figure 1 sums up the main characteristics of Jevons's utility theory.

In Fig. 1, two utility curves for two commodities *x* and *y* of one person ('trading body') are superposed and inverted upon one another. Utility is measured on the vertical axis, commodities on the horizontal. The diagram shows how this person would make a net gain in utility by extending trade from *a'* in the direction of m, and would lose in utility when trading beyond that point. Hence, there automatically emerges an equilibrium for this individual at m.

This balancing model was taken to represent the individual's balancing of pleasures and pains at the margin. As Jevons put it in the *Theory*: 'the will is our pendulum and its oscillations are minutely registered in the price lists of the markets'. This theory enabled Jevons to state relative prices in terms of relative marginal utilities. What it did not show was *how* an equilibrium price was actually obtained through price adjustments, something that had been pointed out to him earlier in correspondence with Fleeming Jenkin. Hence, Jevons's theory did not explain price *formation;* it only showed how individuals adjusted their demands at a *given* price.

In the *Theory* Jevons suggested that numerical precision could be given to his theory by taking the so-called King–Davenant Price Quantity Table as an example, just as he used his experiments on work and fatigue to show that in principle numerical precision could be given to his theory of labour. This small table was found in the work of the 17th-century political arithmeticians Gregory King and Charles D'Avenant and allegedly contained statistical data on prices and quantities of wheat. Through the 19th century it had been widely used to argue for or against the possibility of mathematizing political economy, for example by Thomas Tooke, William Whewell, but also by Cairnes (Creedy 1992). Jevons showed how this table could give numerical exactness to the notion of the final degree of utility, the 'all important element of political economy', and so how statistical data could give precision to theory (Stigler 1994; White 1989).

The remainder of the book contained Jevons's theory of rent and capital that are interesting in their own right, but it was undeniably his theory of utility, worked out in his theory of exchange and labour, that brought Jevons the fame he hoped for. But not immediately.

In a letter to Cairnes of 5 December 1871 (Mill 1972, pp. 1862–3), Mill wrote that he certainly would agree with Cairnes's negative judgement on the book:

> I have not seen Jevons's book, but as far as I can judge from such notices of it as have reached me [in Avignon], I do not expect I shall think favourably of it. He is a man of some ability, but he seems to have a mania for encumbering questions with useless complications, and with a notation implying the existence of greater precision in the data than the questions admit of. His speculations on Logic, like those of Boole and De Morgan . . . are infected in an extraordinary degree with this vice.

Interestingly, Mill considered Jevons's mathematical endeavours in economics on a par with his 'speculations in logic'. Behind Mill's irritation we may guess a genuine concern with mechanistic theories of the mind, which Mill feared were a degradation of man's most 'ennobling' characteristics. It is only after Jevons's strong mechanistic image of man as a balance of pleasures and pains and the Victorianobsession with the problem of free will waned that his 'mechanics of utility and self-interest' could be considered to deal with rational choice. One will search in vain for this notion in Jevons's original work, however.

Jevons's Later Years

The publications dating after the *Theory* and *Principles* are generally thought to be of much less importance. Jevons turned his attention to his notorious sunspot studies, in which he attempted to establish a causal connection between solar activity and commercial crises. Though these studies were generally seen to be failures, the famous astronomer William Herschel had in fact voiced similar ideas on the relationship between agricultural output and the activity of the sun in the early 19th century. Jevons had to make increasingly far-fetched assumptions as to the causal mechanism involved, which cast doubt on the whole enterprise. Jevons also wrote a number of highly successful primers; the primer on logic went through numerous reprints (up to 1931), and his *Money and the Mechanism of Exchange* (1875) sold well too. Jevons also worked on the second edition of the *Theory,* which appeared 1879 and which contained an extensive survey of precursors in mathematical economics. In *The State in Relation to Labour* (1882) and a posthumous collection of essays on social reform (1883), Jevons turned his attention to the social and political issues of his day, issues that had been close to his mind from his formative years in Australia. At the end of the 1870s he wrote a number of vehement attacks on Mill's philosophy that, given the towering status of Mill as a political economist and philosopher, actually harmed Jevons's own intellectual status. Having moved from Owen's College to University College, London, in 1876 to take up the professorship in political economy, he resigned in 1880, partly because of problems of health but more importantly to be able to devote all his time to writing. His untimely death in 1882 left his last large project, the *Principles of Economics,* unfinished. It was published, with some additional essays, in 1905.

Jevons's Investigative Spirit

Jevons's statistical work in the 1850s and 1860s, his imaginative, though less well – known, work in formal logic, and in particular of course his *Theory of Political Economy* and *Principles of Science* stand out as landmark contributions to economics and to the philosophy of science. A genuine Victorian polymath, Jevons worked in many different fields of the sciences, all of which he engaged in the same investigative spirit. Though some of his work in the 1870s was quite successful, some lacked the sharpness and acuity of his earlier work. Equally well at home in theory as in the 'black arts of inductive economics', Jevons was, as Keynes noted in his 1936 obituary, 'the first theoretical economist to survey his material with the prying eyes and fertile controlled imagination of the natural scientist'.

Jevons's investigative spirit, with its typical belief in the power of mathematics to capture the mechanical principles of the subject under study, irrevocably altered the image of economics, and is perhaps still with us. In many of the sciences, a satisfactory explanation nowadays requires the description of a mechanism, and economics is no exception to this. Nobel laureate Robert Lucas once described economic theory as providing an 'explicit set of instructions for building … a mechanical imitation system' (1980, p. 697). In retrospect we may hear the echo of Jevons's approach to economics in these words.

See Also

- Analogy and Metaphor
- Energy Economics
- Equation of Exchange
- Functional Analysis
- Index Numbers
- Labour Theory of Value
- Law of Indifference
- Marginal Revolution
- Mathematical Methods in Political Economy
- Statistics and Economics
- Utilitarianism and Economic Theory
- Utility
- Wages Fund

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Jewkes, John (1902–1988)

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JEL Classifications
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Jewkes was educated at Barrow Grammar School and Manchester University. His first job was as Assistant Secretary of the Manchester Chamber of Commerce, 1925–26. He was then appointed lecturer in economics at Manchester University, and stayed there for three years. Following a period in the United States, he returned to Manchester as Professor of Social Economics in 1936. After holding this chair for ten years, he was appointed Stanley Jevons Professor of Political Economy at Manchester. In 1948 he became Professor of Economic Organization at Oxford, and a Fellow of Merton College, and held this chair until his retirement in 1969. His professional contacts, however, remained mainly outside Oxford. Jewkes had a distinguished wartime career. He became Director of the Economic Section of the War Cabinet Secretariat in 1941, and was appointed Director-General of Statistics and Programmes at the Ministry of Aircraft Production in 1943. This was followed by other posts, and after his return to university life he was a member of a number of royal commissions and other official committees.

Jewkes's Manchester roots, together with his wartime experience, made him a powerful advocate of free-market solutions. His first notable book on this subjectwas *Ordeal by Planning* (1948), followed by *Public and Private Enterprise* (1965), *New Ordeal by Planning* (1968), and *A Return to Free Market Economics*? (1978). In these works he advocated the virtues of the free market, as opposed to government ownership or government planning, as a fruitful background for economic efficiency and individual initiative. He argued that government efforts to replace the market had produced one debacle after another, and also that economists claimed too much for their subject, thus reducing their potential usefulness. Before the Second World War Jewkes's work had concentrated on detailed studies of the economic and social problems of Lancashire – as, for example, in his *Wages and Labour in the Cotton Spinning Industry* (1935, with E.M. Gray). Some of his work after the war also concentrated on detailed problems, but in a national or international context. For example, he published studies, jointly with his wife Sylvia, on medicine and the National Health Service, arguing that the state-operated National Health Service had displayed many weaknesses. A notable contribution to the literature on innovation was his *The Sources of Invention* (1958, with David Sawers and Richard Stillerman). This was one of the earliest attempts at systematic investigation in this field. It successfully established the importance of thesmall-scale inventor, and showed that many notable 19th- and 20th-century inventions were essentially the work of one or two individuals, working with limited resources. This may well prove to be his most lasting contribution.

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Jim Crow South

Gavin Wright

Abstract

The US South maintained a distinctive economic and political structure from the demise of slavery in the 1860s to the Civil Rights revolution of the 1960s. Racial wage differentials in the unskilled labour market were small. But blacks were virtually absent from higher-paying skilled jobs. Disfranchisement led to a drastic fall in relative expenditures on black schooling between 1890 and 1910. The effort to protect cheap labour reinforced regional isolation, depriving the South of dynamic stimulus from new migrants, enterprise and ideas. Conflicts between recruitment of capital and demands for racial justice were resolved only by federal intervention.

Keywords

Agriculture; Arrow, K.; Becker, G.; Black-white wage differentials; Civil rights movement; Convict labour; Economic development; Human capital; Internal migration; Jim Crow South; Key, V.; Minimum wage; Racial discrimination; Regional development; Schooling; Segregation in labour markets; Slavery; Trade unions

JEL Classifications

N3

'Jim Crow' was a blackface caricature from a minstrel show that pre-dated the US civil war. The term came to represent the regime of racial segregation that became entrenched in both law and custom by the end of the 19th century in the US South.

From the demise of slavery in the 1860s to the Civil Rights revolution of the 1960s, the southern states maintained a distinctive economic and political structure. This historical episode raises a number of issues of general interest for economics, among them the effects of segregation on efficiency, and the impact of the segregationist regime on the economic progress of the region as a whole.

Jim Crow segregation did not emerge full-blown in the aftermath of war and emancipation, but instead had its own evolution. Appearing in the midst of the school segregation debate of the 1950s, C. Vann Woodward's classic *The Strange Career of Jim Crow* (1955) overturned the myth that the races had 'always' been separated in the South, noting that explicit racial codes did not appear in most states until the 1890s. Blacks participated actively in Southern politics during Reconstruction (the period of federal military control, 1865–77), and longer in many states. Only when it became clear that neither the federal government nor the Supreme Court would intervene were Southern states emboldened to disfranchise black voters, using a variety of ostensibly non-racial devices (such as poll taxes and literacy tests)

whose racial intent was barely disguised. Mississippi's constitution of 1890 was the first statewide disfranchisement programme, and by 1910 the exclusion of blacks from Southern politics was nearly complete. Legally mandated segregation soon followed disfranchisement, ultimately extending not only to schools, churches, eating establishments and recreation, but to public transportation, hospitals, prisons, cemeteries and other avenues of life. Although all were aware that it was honoured more in the breach than the observance, the 'separate but equal' principle was upheld by the US Supreme Court in the famous 1896 case, *Plessy vs. Ferguson.*

Even more onerous than the demand for physical separation were brutal features of the Jim Crow South, such as lynching (extra-legal executions) and convict labour (leasing of prisoners to private contractors). Neither of these phenomena was exclusively racial, but their impact fell most heavily on black Southerners.

Segregation and Labour Markets

Extensive as the scope of legal segregation became, its limits were equally notable. Racial aspects of employment and work relations were virtually unregulated. The only industrial segregation laws of any importance – a North Carolina statute requiring separate toilets and a South Carolina law requiring segregation in cotton textiles – were adopted only in 1913 and 1915, respectively – long after prevailing racial patterns were established – and were not imitated elsewhere. Yet, despite the absence of legal enforcement, segregation was the norm in Southern industries. In his study of Virginia firms in 1900 and 1909, Higgs (1977, p. 241) found that 'occupational workforce segregation was overwhelmingly the rule'. Interestingly, racial separation was more prevalent and more clearly delineated by industry than by location. White cotton mills and black tobacco factories coexisted in places like Durham, North Carolina, and Danville, Virginia; in Birmingham, Alabama, where two-thirds of iron and steel workers were black, the Avondale cotton mill was 98.1 per cent white.

Explaining segregation in labour markets does not pose a serious challenge for economic theory. The models of Becker (1957) and Arrow (1973), among others, show that, if whites demand a premium for working in close association with blacks, segregation dominates mixed alternatives. The issue that economists have wrestled with is not segregation per se, but wage discrimination: did segregation serve to support an 'unjustified' wage differential, or was it merely the market's way of avoiding the costs of mixing the races? The perhaps surprising finding of numerous studies is that, despite the prevalence of racism in the Jim Crow South, racial wage differentials in the open (unskilled) labour market were small or non-existent.

In agriculture, wage labour coexisted with sharecropping and other forms of tenancy. Although whites had a large overall advantage in farm property and incomes, whites as well as blacks could be found at all stages of the 'agricultural ladder'. With rare exceptions, black and white farm labourers were paid the same wage. For example, in 1887 the North Carolina Bureau of Labor Statistics posed the question of racial wage differences to landlords as well as to tenants and labourers. In 94 of the 95 counties, the landlords reported 'no difference' between the races, and in 77 of the 95 counties the tenants and labourers gave the same response (cited in Higgs 1978, p. 310). Even more remarkable, evidence from pre-First World War Virginia indicates that unskilled wages were equilibrated for black and white labourers, even across highly segregated industries such as cotton textiles and tobacco manufacturing (Whatley and Wright 1994). The large intermediating agricultural sector may have been important in maintaining this equilibration for men, because the same data suggest a 25 per cent wage gap in favour of white over black women, who did not have access to farm labour jobs.

Equally noteworthy, however, is the virtual exclusion of blacks from higher- paying skilled jobs in Southern industry. Within agriculture, blacks were often able to rise up the ladder of accumulation, from wage labour to tenancy and even to farm ownership, albeit usually on a small

scale. Such advancement opportunities were rare in non-agricultural sectors. In some cases, such as railroads, barriers to black promotion were enforced by all-white craft unions (Sundstrom 1990). Elsewhere blacks were held back even in the absence of unions and even where skills were largely acquired on the job. Promotion of blacks to supervisory positions over whites was widely seen as unthinkable. Thus, despite the efficacy of labour markets in equilibrating unskilled wages, access to skilled positions was distinctly unequal between the races.

Race and Schools

One direct consequence of disfranchisement was a drastic fall in relative expenditures on black schooling. The inequity was most extreme in the black- majority counties of the lower South, where funding was simply diverted from white to black schools. For example, in Mississippi in 1907 predominantly white counties spent $3.50 per school-age child on blacks but $5.60 on whites; in predominantly black counties, $2.50 was spent on blacks but $80.00 on white children. Black schools were also characterized by lower teaching salaries, higher student-teacher ratios, shorter terms and lower educational levels of teachers (Bond 1934).

Economists often identify poor schooling as the primary explanation for low black incomes throughout the Jim Crow era (Smith 1984). This interpretation meshes comfortably with the perspective emphasizing that barriers to black progress operated through political channels rather than through discrimination in markets. Economic historians, however, generally interpret the politics of Jim Crow as part of a larger political-economic package.

Landowning planters actively opposed higher spending on black schools, not just because funding could be diverted towards white children but because 'educated Negroes, in nearly all cases, become valueless as farm laborers' (quoted in Anderson 1988, p. 96). As one Arkansas planter put it in 1900: 'My experience has been that when one of the younger class gets so he can read and write and cipher, he wants to go to town. It is rare to find one who can read and write and cipher in the field at work' (quoted in Wright 1986, p. 79). In other words, restricting black education was a way of preserving the agricultural labour force.

Even outside of agriculture, exclusion of blacks from skilled jobs exercised a feedback effect on the demand for education. When the Rosenwald Fund sought to provide funding for black high schools in the South during the 1920s and 1930s, it learned that there were no black jobs for which a high-school education would be useful. Thus, black schools typically did not offer training in such subjects as stenography, accounting, bookkeeping, printing or typing. The fund's curriculum expert acknowledged: 'If commercial courses were offered in the Negro school there would no doubt be tremendous pressure to get into them and the only result would be keen disappointment for nearly everyone' (quoted in Anderson 1988, pp. 223–4).

Because of this mutual interaction between schooling and labour markets, the interwar years saw the opening of a racial wage gap for entry-level positions, in contrast to pre-First World War patterns. Proximate reasons for divergence include stagnant world demand for cotton during the 1920s, disproportionately affecting blacks, and an upward shift of real wages in the all-white cotton textiles industry, initially because of wartime inflation, and subsequently resistant to reduction for both internal and external reasons. The long-term consequence was that racial segregation took on a different economic character, becoming more a 'vertical' support for wage differentials than a 'horizontal' separator of the races as in the earlier period. According to a 1937 survey (Perlman and Frazier 1937), firms hiring only blacks paid starting wages one-third lower than those hiring only whites; of those hiring both, nearly 30 per cent paid blacks a lower starting wage. In contrast, no explicit racial wage differential was reported in Northern firms. The 'separate wage rates for Negroes' that Southern observers took to be 'a fixed tradition' had in reality developed and become institutionalized only in the 20th century (Whatley and Wright

1994). Margo (1990) finds that employment segregation increased between 1900 and 1950, even after racial differences in schooling are controlled for.

Economic Development in the Jim Crow South

Granted that the Jim Crow regime adversely affected African Americans, the question may be posed: what was its effect on economic development in the region? Although theory suggests that racial discrimination is inefficient, it is not straightforward to detect inhibiting effects on the growth of major Southern industries. Cotton textiles, the most racially exclusive of them all, surpassed the historic New England branch by the turn of the 20th century. Rapid growth in such diverse industries as iron and steel, fertilizer, tobacco manufactures and furniture did not seem to be hindered by the colour line in employment, and Southern value-added in manufacturing grew faster than the national average throughout the Jim Crow era. Nonetheless, per capita income in the South was roughly half the national average as of 1880, and this ratio had barely changed by 1940. Can this failure to converge on national norms be tied to Jim Crow institutions?

Growth-accounting analysis attributes much of the regional income gap to low levels of education in the South (Connolly 2004). Underinvestment in human capital extended to Southern whites as well as blacks, a phenomenon that was also historically linked to race. Disfranchisement of blacks deprived many lower-income whites of the vote at the same time, preventing a class-based political mobilization that might have overcome planter opposition to funding for public schools (Kousser 1974). In the classic analysis of political scientist V.O. Key (1949), regional unity on the race issue led to one-party politics, depriving the South of the popular political participation that elsewhere supported public schools and other measures favoring economic development.

Perhaps the worst effect of Jim Crow on economic development was that the effort to protect cheap regional labour led to regional isolation, depriving the South of dynamic stimulus from new migrants, enterprise and ideas. In 1910, just two per cent of Southern residents were foreign-born, the lowest share in the nation. Connolly (2004) finds that low levels of human capital did not just lower average incomes in the South but also slowed the diffusion and generation of new technologies. In the 1930s, when regions were actively competing for newly available federal funds, the states of the South – the most solidly Democratic in the country – received the lowest levels of federal support per capita. One main reason was that Southern political and business leaders feared the effects of federal funding on wages, labour discipline and race relations.

The Demise of the Jim Crow South

The Jim Crow world crumbled under federal pressure during the 1960s. But this political revolution was preceded by an earlier regime change in economic policy, occurring between the 1930s and the 1950s. At that time the South began its modern economic take-off, an acceleration of growth dated from approximately 1940. As a case study in economic modernization, the episode is highly unusual in that the acceleration coincided with massive outmigration from the region in question. Low- income, poorly educated Southerners left the countryside for cities in both North and South, while professionals and retirees began to move Southward, into fast-growing cities and sunbelt retirement areas. Migration was racially as well as economically selective. Net Southern *white* outmigration all but ended by the 1950s, while blacks continued to leave the region in large numbers through the 1960s.

With the advent of the national minimum wage (and related labour market regulations) in the 1930s, and the renewal and extension of these policies in 1950s, it was clear to business leaders of the South that an Asian-style industrialization based on cheap labor within US borders was not going to be politically acceptable. At roughly the same time, full mechanization of cotton growing became feasible, and was all but complete by

1960. Together, these developments tipped the political balance towards vigorous efforts to attract business through tax breaks, municipal bonds for plant construction, industrial development corporations, research parks and expenditures on publicity far beyond those of other regions. James C. Cobb (1982) calls it the 'selling of the South'.

One might suppose that enlightened Southern businessmen should have led the way in breaking down racial barriers, but the evidence suggests that most were extremely reluctant to do so. In city after city, business leaders weighed in on the side of compromise, but only after political turbulence reached the point where it threatened the flow of investment capital. For their part, employers had no strong economic motives for challenging racial norms, since low-end wages were governed by federal law, and few blacks were qualified by education or experience for high- end jobs. This perverse regional equilibrium might have survived indefinitely on purely economic grounds. But ultimately the irresistible force of economic progress came into collision with the immovable object of Jim Crow.

The leverage of the movement derived from the fact that competition for outside capital required Southern leaders to present their towns and cities as safe, civilized communities, with a labour force that was well-behaved and eager for work. The most famous case in point was Little Rock, Arkansas, where a promising postwar development programme came to a standstill when Orval Faubus called out the National Guard to block court-ordered school integration in 1957. Although the city had attracted eight new plants in 1957, not a single new plant came to Little Rock during the next four years. A widely discussed *Wall Street Journal* headline for 26 May 1961 read: 'Business in Dixie: Many Southerners Say Racial Tension Slows Area's Economic Gains.' In her systematic review of Southern businessmen's response to the desegregation crisis, Elizabeth Jacoway writes, 'In the 1950s and 1960s, white businessmen across the South found themselves pushed – by the federal government and civil rights forces as well as by their own economic interests – and values – into becoming reluctant advocates of a new departure in southern race relations' (Jacoway and Colburn 1982, p. 1). In a sense they had to be coerced to act in their own economic interest! Although few were willing to say so in public, many local leaders and business proprietors were privately grateful for civil rights legislation of the 1960s, at least after the fact. These measures largely put an end to disputes over public accommodations and employment segregation, while providing managers the ready-made excuse that the matter was no longer in their hands (Wright 1999).

Since then, the South has been the most rapidly growing region in the United States. The political revolution has generated economic gains for blacks as well as whites. After the political breakthroughs of the 1960s, more than 50 years of black outmigration came to an end, and blacks have been moving into the region ever since. Net black migration into the South amounted to more than 500,000 between 1990 and 2000, whereas net black migration was negative for each of the other census regions. The attraction of the New South for blacks has economic as well as cultural, political and geographic aspects. As of 1977, the majority of the nation's black-owned businesses were in the South. Median black income grew faster in the South than elsewhere, and by the end of the 20th century equalled or surpassed median black income in the north-eastern and the mid-western regions.

See Also

- ▶ Black–White Labour Market Inequality in the United States
- ▶ Regional Development, Geography of

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Johannsen, Nicolas August Ludwig Jacob (1844–1928)

Henry W. Spiegel

Nicolas Johannsen was a brilliant outsider with insights into theoretical economics that were ahead of his time. He was born in Berlin but spent much of his life in New York, where he was active in the import–export business. He is best known for having anticipated Keynes's saving-investment relationship and the multiplier in *A Neglected Point in Connection with Crises* (1908). In other writings, some of which are quite elusive, having been published under pen names or in German, Johannsen developed a view of the economy in terms of circular flows of money and economic activities portrayed in the form of a wheel-of-wealth diagram (1903). This was not the first attempt of this kind, but was perhaps the first to provide a complete statistical underpinning. Like Silvio Gesell, but independently of him, Johannsen also proposed a tax on paper money, visualized as coming close to a single tax (1913).

As a forerunner of Keynes, Johannsen considered fluctuations in investment the strategic factor in business cycles. Depressions occur as a result of vanishing investment opportunities. If investment declined while saving stayed put, there would be an excess of saving over investment which Johannsen called 'impair saving'. This would go into 'impair investment', that is, purchases of existing assets or grants of loans to persons whose income were reduced in consequence of declining normal investment and who desired to maintain their consumption expenditure. Johannsen also drew attention to the fact that adverse effects suffered in one sector of the economy would spread and multiply through others. He estimated the propensity to save at one-seventh of income and the multiplier at five. The two estimates can be reconciled if allowance is made for negative saving, which Johannsen did not do. In the 1920s, Johannsen's concern with diminishing investment opportunities became more pronounced, and in 1926 he predicted that 'a depression seems due within an early year' (1926, p. 2).

Johannsen's views, highly unorthodox as they were at his time, were appreciated only among a handful of his contemporaries. He used pen names to hide his writings from his employers. Keynes referred to him with great condescension in the *Treatise on Money* and did not mention him in the *General Theory*. Johannsen seems to have been an iconoclast by habit. He also dabbled in astrophysics and there too, proffered views that offended orthodox opinion. His work in economics

illustrates that important advances are often made by outsiders who do not suffer from the limitations of the expert.

About Johannsen, consult Dorfman (1949, vol. 3, pp. 408–13), the first comprehensive account of Johannsen's life and work, which may be supplemented by Dorfman's introduction to the 1971 reprint of Johannsen's *Neglected Point* as well as by his introductory essay to Clark (1970).

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Johansen, Leif (1930–1982)

Karl H. Borch

Keywords

Bargaining; Bargaining sets; Central planning; Coalitions; Economic growth; Frisch, R. A. K.; Game theory; Haavelmo, T.; Johansen, L.; Labour theory of value; Leontief's input–output model; Marginal utility; Perfect competition; Prisoner's Dilemma; Production functions; Public economics

JEL Classifications

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Johansen was born in Eidsvoll, Norway, on 11 May 1930 and died in Oslo on 29 December 1982. He entered the University of Oslo in 1948, and received the equivalent of a Master's degree in economics (*cand.oecon.*) in 1954. He was awarded a doctors degree (dr. philos) in 1961, for a dissertation with the title 'A Multi-Sectoral Study of Economic Growth'.

In 1951 Johansen became research assistant to Ragnar Frisch. After graduation the university awarded him a research fellowship. In 1958 he received a Rockefeller Fellowship, which he held until in 1959 he was appointed Associate Professor of Public Economics at the University of Olso. On the retirement of Frisch in 1965, Johansen became Professor of Economics at the University of Oslo, with the special duty of lecturing on macroeconomic planning.

Johansen's first important work is his doctoral dissertation, mentioned above. This book (1960) builds a bridge between the theory of economic growth, which had become fashionable in the 1950s, and Leontief's input–output model, which at the time was widely used in economic planning and forecasting. The choice of dissertation topic was undoubtedly influenced by Johansen's two mentors, Frisch and Trygve Haavelmo, who were then both working in these fields.

In the dissertation Johansen presented a theoretical model, and applied it to Norwegian data. He analysed a 23-sector model of the economy, and it seems that at first this empirical part of the work was considered the more important.

After a few years, however, it became clear that the model, often referred to as the MSG-model, had considerable merits in itself. It became the basis for long-term planning by the Norwegian Ministry of Finance, and over the years it was

developed and extended. Johansen took an active part in this work. It seems that the model also influenced planning methods in several countries, and a new and enlarged edition of the book was published in 1974.

The laws of production must play an important part in any growth model, and Johansen continued and extended the pioneering work of Frisch on production functions in a series of articles which had considerable influence. The main results in these papers are brought together and generalized in the book from 1972: *Production Functions: An Integration of Micro and Macro, Short Run and Long Run Aspects*. The subtitle indicates the high aspiration level of the book, and it did present production functions which were realistic and so general that they could be used in multisectoral planning models.

Johansen was a member of the Communist Party of Norway until he died, and he participated actively in some election campaigns. However, his political views have hardly left a trace in his professional writing. An uniformed reader will be at loss to divine which political opinions – if any – the author holds. Johansen seems to have written relatively few papers on planning in eastern Europe and on Marxist economic theory, and none after 1966. His objectives seem to be to inform and explain, rather than to convert, and often it seems that these papers are written on request – for instance his paper 'Labour Theory of Value and Marginal Utilities' (1963). This is an extension and clarification of some short comments he made in a discussion the year before. It shows that under certain circumstances the two theories can be reconciled. Johansen served on a number of expert committees appointed by different Norwegian governments, and was accepted as the objective scientist who would point out logical inconsistencies but never let his personal views influence the recommendations he made.

There is, however, little doubt that Johansen's political opinions had a marked effect on his career. Under the rules in force in the 1950s and 1960s it was impossible for him to obtain a visa to the USA. He therefore did not have the opportunity of spending some of his formative years at an American university. Such opportunities were regularly offered to bright young academics in western Europe and usually had a profound influence on their later work. Johansen missed this experience, and in fact never visited the USA. He remained a European, and principally a Norwegian. Most of his work was published in Europe, and about half of it was written in Norwegian.

Johansen's political views did not affect his scientific work, but his views did inevitably influence his opinions as to which economic problems were important and which should be studied. His views naturally led him to study economic planning, and this subject remained Johansen's main interest during most of his professional life. His two-volume *Lectures on Macroeconomic Planning* (1977 and 1978) is a landmark. It is essentially a textbook which gives a balanced overview of the major issues in the economics of planning, integrating the results Johansen reached over 25 years with those of the many others who contributed to the development of the subject. As often Johansen appears as a master in reconciling different views and approaches. A third volume was in preparation at the time of Johansen's death, and this might have rounded off the work, and removed the many gaps and omissions which reviewers found in the presentation.

Economic planning is closely related to, if not a part of, the subject which has become known as 'public economics'. The subject may not be very well defined, and its contents have certainly changed over the years. The central topics, however, remain taxation, public expenditure and social welfare. When Johansen began to lecture on the subject at the University of Oslo in 1960, there was no single book which covered this heterogeneous subject. He published his own textbook in Norwegian in 1962. A revised and extended edition appeared in 1965, and was translated into English in the same year as *Public Economics*. The book did not give any clear definition, nor did it define the limits of the subject. Perhaps too tailor- made for his students at the University of Oslo, it deals very briefly with topics covered by other courses in the curriculum. The book did, however, have an impact, and helped to establish 'public economics' – suitably defined – as a recognized part of economics.

Johansen was one of the founders of the *Journal of Public Economics*, which first appeared in 1972. He served as co-editor from the beginning until his death, and he contributed the opening article of the new journal. Its title, 'On the Optimal Use of Forecasts in Economic Policy Decisions', indicates how broadly Johansen tended to view the subject of public economics.

In his later years Johansen developed a strong interest in game theory. He seems to have been led to this subject by Arrow's proof that non-dictatorial and efficient decisions were impossible, and he wrote a penetrating paper on the subject in 1969. A model of central planning will naturally be compared – for efficiency and fairness – with a model of free competition. The assumptions leading to neoclassical equilibrium are generally considered to be unrealistic, and game theory, with its different solution concepts based on compromises between coalitions, were developed as a generalization of the standard market model. The same idea can be applied to a central planning model. Plans are rarely drawn up and executed by a consistent single-minded dictator. Usually they appear as a compromise between different interest groups (coalitions) in society, or within a bureaucracy.

Johansen's first publication on game theory seems to be a short article in Norwegian with the title 'Plans and Games' from 1970, contributed to a Festschrift with the general title 'Economics and Politics'. Here he shows that, if there are several independent decision makers, with different preferences, the collective decision must necessarily be a compromise.

In the following years Johansen published a few papers in Norwegian along similar lines. His first paper on a game theory in English is 'A Calculus Approach to the Theory of the Core of an Exchange Economy', published in 1978. Debreu and Scarf (1963) proved that the core of a market game would, under certain conditions, shrink to the competitive equilibrium, as the number of players increased to infinity. Their proof, as well as the ones given by others, depends heavily on topological or measure theoretical arguments, which make the results inaccessible to most economists of the older generation. Johansen shows that the result can be reached by elementary methods, under the assumptions conventionally made in neoclassical economic theory. The paper does not appear to be much cited, and its main effect may have been to give Johansen a deeper understanding of the subject.

Game theory is closely related to bargaining theory, and Johansen's next paper on the subject is 'The Bargaining Society and the Inefficiency of Bargaining' (1979). Here he wrote: 'I consider the game theory approach to economic problems to be the most appropriate paradigm as soon as we go beyond mere accounting and description of production technology and want to include various aspects of economic behaviour.' The conclusion of the essentially verbal discussion in the paper is that bargaining is not an efficient way of making social decisions. At the time of writing Johansen did not seem to be aware of the concept of 'bargaining sets' introduced by Aumann and Maschler (1964). The different bargaining sets include the core if it is not empty, and also some subsets corresponding to the cases in which the players fail to agree on a Pareto optimal outcome.

In one of his last papers, 'On the Status of the Nash Type of Noncooperative Equilibrium in Economic Theory' (1982), Johansen argued that the theorem of Nash (1950) has often been misinterpreted and misused in economic literature. The theorem just states that every n-person game has at least one equilibrium point in mixed strategies. In this purely mathematical context equilibrium point means what in mechanics is called a 'dead point', where the forces are in equilibrium. There are few reasons to assume that a point with this property should have any economic optimality property. Johansen observes, inter alia, that in the game known as the 'Prisoner's Dilemma' the only equilibrium point is the worst possible of all outcomes.

During his last years Johansen came to look at game theory as a general theory of economic behaviour, which contains as special cases the two extremes: completely centralized decision making and perfect competition. His work during these years showed that Johansen as always was a quick learner, and that at his death at the age of 52 he had gained mastery of the relevant parts of

game theory. One can only make guesses about the general theories he might have developed if he had been given a few more years to live.

Selected Works

The obituary published by the Norwegian Academy of Science (*Yearbook* for 1983) lists 11 books and 138 articles written by Johansen, about half of them in Norwegian. Some of the most important in English are:

1958. The role of the banking system in a macroeconomic model. *International Economic Papers* 8: 91–110.

1959. Substitution versus fixed production coefficients in the theory of economic growth. *Econometrica* 27: 157–176.

1960. *A multi-sectoral study of economic growth*. Amsterdam: North-Holland. 2nd enlarged ed., 1974.

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1969b. An examination of the relevance of Kenneth Arrow's general possibility theorem for economic planning. *Economics of Planning* 9: 5–41.

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American Economic Review 68: 813–820.

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Debreu, G., and H. Scarf. 1963. A limit theorem on the core of an economy. *International Economic Review* 4: 235–246.

Nash, J. 1950. Equilibrium points in n-person games. *Proceedings of the National Academy of Sciences* 36: 48–49.

Solow, R. 1983. Leif Johansen 1930–1982: A memorial. *Scandinavian Journal of Economics* 85: 445–459.

Johnson, Alvin Saunders (1874–1971)

Warren J. Samuels

Keywords

American Economic Association; Clark, J. B.; Exploitation; Institutional economics; Johnson, A. S.; Marginalist economics; Protection; Welfare economics

JEL Classifications

B31

Alvin Johnson was born on 18 December 1874 near Homer, Nebraska, and died 7 June 1971 in Upper Nyack, New York. He received a BA (1897) and MA (1898) from the University of Nebraska and a Ph.D. from Columbia University (1902). His varied teaching career included Bryn Mawr, Columbia, Nebraska, Texas, Chicago, Stanford (twice), Cornell and the New School for Social Research of which, in 1919, he was a

founder and, beginning in 1923, director. He was president of the American Economic Association in 1936 and of the American Association of Adult Education in 1939. He was active in the struggle for academic freedom and other civil rights and in providing a haven, at the New School, for refugee scholars. His students included Walton Hale Hamilton, Frank H. Knight and James Harvey Rogers.

Johnson also had an active and varied editorial career. He was assistant editor of the *Political Science Quarterly,* founder and editor of *Social Research,* associate editor of the *Encyclopedia of the Social Sciences*, economics editor of the *New International Encyclopedia*, political science editor of the American edition of *Nelson's Encyclopedia,* and on the editorial council of the *Yale Review.* He also was a founder and member of the editorial staff of *The New Republic.*

Johnson, who also published novels and short stories, wrote as an economist on a wide range of theoretical and policy problems. He was also the author of a popular and respected principles text which went through several editions. As a student of (and secretary to) John Bates Clark, Johnson adhered to his marginalist approach to economic theory but combined his neoclassicism with social and institutionalist elements. His dissertation on rent theory stressed inter-product competition and tried to develop a non-Marxian conception of exploitation (30 years prior to Joan Robinson's work). His early economic nationalism encompassed a limited proprotectionist argument. In various writings he argued that labour-saving machinery did not necessarily raise wages; that forward shifting of the corporate income tax requires price to be a function only of cost of production, which he deemed not prevalent; and that arguments against the minimum wage were based on static assumptions. He considered that prevailing theory offered only universalist, formal explanations to problems of price formation, whereas he found that price phenomena were also the product of a multiplicity of complex variables, and called for greater realism and empiricism. Following Clark, Johnson also anticipated Pigovian welfare economics arguing, in effect, that public ownership could be a solution to cases in which, because of non-approbriables, marginal private benefits fell short of marginal social benefits. For many years he was active in the land reclamation movement.

In general, Johnson was a cautious reformer, advocating reform within the existing social order through the expansion of non-property rights as both a corollary to the security of property itself and a mark of a progressive economy.

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Johnson, D. Gale (1917–2003)

John M. Antle

Abstract

D. Gale Johnson, an intellectual leader in agricultural economics in the mid- to late 20th century, was an early critic of the parity price concept. His case against agricultural subsidies helped bring agricultural trade policy into the international policy arena. Johnson was a longtime observer of the Soviet Union and Chinese agricultural reforms. His analysis showed that investment in agricultural research, including biotechnology, primarily benefited the poor through lower real food prices. He argued that market and policy failures, not population growth, were the root causes of environmental problems in developing countries.

Keywords

Agricultural economics; Agricultural growth and population change; Agricultural markets in developing countries; Agricultural research; Agricultural subsidies; Agricultural trade policy; American Economic Association; American Farm Economic Association; Biotechnology regulation; Genetically modified organisms (GMOs); Johnson, D. Gale; National Research Council (US); Parity pricing; Population growth; Price support; Property rights; Share contracts

JEL Classifications

B31

David Gale Johnson is widely regarded as one of the intellectual leaders in the field of agricultural economics in the mid- to late 20th century. Born and raised on an Iowa farm, in the early 1940s Johnson was an assistant professor at Iowa State University, where Theodore W. Schultz was department head. Due to a dispute over academic freedom, in 1943 Schultz resigned from Iowa State and moved with several junior faculty, including Johnson, to the economics department at the University of Chicago. Johnson became one of the founders of the Chicago School's 'oral tradition' and the workshop system that trained many recognized economists. In addition to his scholarly work and mentoring of students, Johnson served the University of Chicago in various capacities, as Department Chair, Dean of Social Sciences, and Provost. He was President of both the American Farm Economic Association and the American Economic Association, served on numerous national advisory committees, and was an adviser to many governments and international agencies. He was the editor of *Economic Development and Cultural Change* from 1985 until 2003.

Over the course of his career Johnson's research addressed important topics related to the economics of agriculture in both industrialized countries and developing countries. Johnson emphasized both the welfare effects of agricultural policies on farm and rural people, and their effects on the efficiency of resource allocation within agriculture and between agriculture and other sectors of the economy. His early work focused on domestic agricultural policy design. In his influential 1947 book, *Forward Prices for Agriculture*, he provided both a critique of the parity price concept that dominated agricultural policy debate in the post-war era, and an alternative to it based on understanding the dynamics of the agricultural sector. Another focus of his early work was the role of labour resources in agriculture. His classic 1950 paper on resource allocation under share contracts anticipated much of the debate about their efficiency that was to follow in the 1970s and later. In his equally important 1950 paper on the agricultural supply function, Johnson laid the intellectual groundwork for the extensive literature on agricultural supply that would come in later decades. Importantly, this paper also debunked the claim by Galbraith and Black (1938) that the elasticity of agricultural supply is near zero, an argument that was used to rationalize the use of agricultural price supports.

From the 1950s, Johnson's attention moved increasingly to the international policy arena. Perhaps his best-known and most influential work was his 1973 book, *World Agriculture in Disarray*. In this book, Johnson used a general equilibrium model of a growing economy as the basis for his analysis of the impacts that domestic and trade policy interventions have on welfare and resource allocation. Using both theory and data, he showed that output price policies have little or no effect on the returns to the mobile resources engaged in farming (capital and labour), and that it is through the factor markets that returns of farming and other sectors of the economy are equalized. A major conclusion of Johnson's analysis is that the primary effects of subsidy programmes for agriculture is to increase the returns to and price of land, to expand agricultural output, and to induce governments to interfere with international trade. Johnson's work was highly influential in bringing the issue of agricultural trade policy into the international policy arena.

Johnson was recognized as one of the leading experts on agriculture in China, the Soviet Union, and other centrally planned economies. He was

one of the first Americans to tour Russian farms in the mid-1950s and point out the inefficiencies of the communal farm system. Four decades later, he would conclude that the cost of the failed Soviet agricultural policy was a major factor in the ultimate demise of the Soviet Union. Johnson and his students were also close observers of the Chinese agricultural economy, the reforms that began in the late 1970s, and the rapid economic growth that followed those reforms.

In the 1980s and 1990s, Johnson focused an increasing amount of his research on the role of agriculture in economic growth during the 19th and 20th centuries, and its relationship to population growth and the improved well-being of the human population in both industrialized and developing countries. His approach to this topic was a direct extension of his vision of agriculture and its role in economic growth. Johnson's investigation of US agricultural incomes in the 1930s and 1940s was essentially a study of the economics of agriculture in a developing economy. Later Johnson applied insights from his earlier work to analyse economic development in an international context. His work on economic development emphasized the contributions of improvements in agricultural productivity to economic development, the falling real price of food and consequently to improving food security. A further consequence of growing agricultural productivity, combined with the low income elasticity of demand for farm products, was migration out of agriculture.

Throughout his career, Johnson emphasized that the per capita supply of agricultural commodities has been increasing for more than a century, despite the fact that this period has experienced the highest population growth rates in human history. Johnson frequently emphasized that, since at least the 1860s, the long-term trend in the real price of agricultural commodities has been downward, and at an accelerating rate. Between 1866 and 1996, for example, the real price of wheat declined at an annual average rate of 0.89 per cent, but between 1955 and 1996 the annual rate of decline in the real price of wheat was 2.69 per cent. Combined with the fact that the poorest people of the world spend much more of their income on food than richer people, Johnson inferred that gains from agricultural growth had been widely shared and had actually benefited the poor most.

Johnson's ability to disentangle long-run trends from short-term shocks made his advice valuable to governments, but it was often at odds with conventional wisdom. For example, during the 1970s many commentators, politicians and economists thought that a new era of resource scarcity was emerging. Projections were for high and rising farm prices. Farmers were encouraged by farm price-support policy and exhortations from the Secretary of Agriculture to plant 'fence-row to fence-row'. Johnson was one of the few voices urging caution and more appreciation of the long history of falling real farm commodity prices. Only when prices collapsed in the early 1980s and, inevitably, the budget costs of farm subsidy programmes exceeded all government projections was Johnson's message appreciated. A similar episode, concerning China's role as a grain importer, occurred almost two decades later. Again, Johnson, the source of careful economic logic and sound data analysis, pointed out the sloppy thinking behind the dramatic pronouncements like 'Who will feed China?' Within a few years Johnson had been again proven right as China has continued to be a significant grain exporter. Johnson summarized his views of the agricultural supply pessimists as follows; '. . .those who make their living by presenting the future of food supply in very negative terms should be called upon to show conclusively why the remarkable record of the recent past will not continue' (Johnson 1999, p. 23).

Johnson also addressed the issue of population growth, and chaired a National Research Council (NRC) committee whose 1986 report, *Population Growth and Economic Development*, proved to be controversial. Contrary to the conventional wisdom of the time (or of today), this report argued that population growth per se was not a major cause of low rates of economic growth or environmental problems in developing countries. The arguments in the NRC report were straightforward implications of economic reasoning. First, the report pointed out the various economic arguments, such as agglomeration economies,

scale economies, and the arguments of endogenous growth theory, which suggest that higher populations and higher population densities may increase productivity. Second, the report made the point that environmental degradation is caused not by population per se but by the lack of appropriate institutions, including well-defined and legally defensible property rights. Third, the report emphasized the substitutability of many resources and the role of prices in signalling resource scarcity and in leading to requisite adjustments in resource utilization and innovation.

Given the importance that Johnson attributed to agricultural technology as a source of improvement in human well-being since the Industrial Revolution, he also argued forcefully against anti-technology sentiments. In particular, Johnson expressed concern about the potential negative impact that regulation of biotechnology could have on the well-being of the world's poor. He outlined these concerns in one of his last publications (Johnson, 2002). He pointed out that the costs of regulating genetically modified organisms, such as bio-fortified foods, will be borne largely by the world's poor, as they are the only ones who spend a significant share of their income on food and would benefit most from an increased availability of micronutrients at a low cost. In addition, he argued that regulations on biotechnology would discourage investment in research, and he noted that biotechnology could bring significant benefits by providing natural substitutes for synthetic pesticides that are costly for poor farmers and have well-known adverse health and environmental impacts.

See Also

- ▶ Agricultural Economics
- ▶ Agricultural Markets in Developing Countries
- ▶ Agricultural Research
- ▶ Population and Agricultural Growth

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Johnson, Harry Gordon (1923–1977)

Jacob A. Frenkel

Keywords

American Economic Association; Brain drain; Capital theory; Distortions; Econometric Society; Flexible exchange rates; Free trade; Gains from trade; Growth and international trade; Immiserizing growth; Inflation; International monetary economics; International trade

theory; Johnson, H. G.; Keynesian revolution; Monetary approach to the balance of payments; Monetary statistics; Monetary theory; Monopoly power; Optimal tariffs; Phillips curve; Retaliation; Second best; Transfer problem

JEL Classifications
B31

Harry G. Johnson was born in Toronto, Canada on 26 May 1923 and died in Geneva, Switzerland on 9 May 1977. Throughout his professional career he was a recognized leader of the economics profession in the United States, Britain and Canada, though his influence extended worldwide. He wrote prodigiously: 526 professional scientific articles, 41 books and pamphlets and over 150 book reviews. In addition, he edited 27 books and wrote numerous pieces of journalism. His writings are characterized by creative insights and by a unique capacity to synthesize; both clarify apparently untidy and unyielding masses of seemingly unrelated and abstruse contributions. His impact on the economics profession was enhanced by his ceaseless participations in conferences around the world, and by his willingness to lecture even at the smallest campus or institute, both of which he perceived as a professional obligation.

He graduated from the University of Toronto in 1943 and then spent a year at St. Francis Xavier University in Nova Scotia as Acting Professor of Economics (at the age of 20). After military service in the Canadian Infantry, he proceeded to Cambridge, England, obtaining his BA in 1946. He taught in the following year at the University of Toronto, where he also received his MA, specializing in economic history. He then spent 1947–8 at Harvard, followed by a year at Jesus College, Cambridge and then election to a Berry-Ramsey Fellowship at King's College in 1949. He was to remain a Fellow of King's, teaching also at the London School of Economics, until he left Cambridge for the University of Manchester as Professor of Economic Theory in 1956. In 1959 he joined the University of Chicago as Professor of Economics, later becoming the Charles F. Grey Distinguished Service Professor of Economics, and remained there until his death. He was soon to combine the professorship at Chicago with a chair at the London School of Economics (1966–74) and then with the Graduate Institute for International Studies in Geneva, Switzerland (1976–7).

These shifts in location and the associated changes in intellectual environment shaped his character as a cosmopolitan economist. The years in Cambridge and in Chicago were to be the most significant. For both campuses had, in addition to Johnson himself, remarkable figures in economic science such as Dennis Robertson, Richard Kahn, Nicholas Kaldor and Joan Robinson in Cambridge, and Milton Friedman, George Stigler and Theodore W. Schultz in Chicago. The strong professional and political views and interests of many of these economists must have deepened Johnson's interest in developing theory as a tool of policymaking, and influenced the evolution of his own views and attitudes toward the various approaches to economics.

His writings span the entire range of the economics discipline: from the history of economic doctrines to the economics of the price of gold; from the theory of international commodity agreements to the theory of preferences and consumption; from an analysis of Keynesian economics to the theory of income distribution. They cover, too, the economics of reparations, the theory of productivity, growth and the balance of payments, the theory of tariffs, economic policies for Canada, Britain, the United States and developing countries, the theory of excise taxes, the economics of public goods, the economics of common markets, the economics of monetary reform, the theory of inflation, the theory of index numbers, the theory of nationalism, the state of international liquidity, the theory of advertising, the relationship between planning and free enterprise, the theory of the demand for money, the choice between fixed and floating exchange rates, the economics of basic and applied research, the economics of the brain drain, the economics of poverty and opulence, the theory of distortions, the theory of money and economic growth, the theory of effective

protection, the theory of human capital, the economics of bank mergers, an analysis of efficiency of monetary management, the economics of the North–South relationship, an analysis of minimum wages, the economics of student protest, an analysis of the infant-industry argument for protection, the economics of the multinational corporation, the economics of universities, the economics of libraries, the economics of international monetary union, the economics of dumping, an analysis of the role of uncertainty, the economics of smuggling, an analysis of income policy, the economics of speculation, an analysis of mercantilism, the economics of bluffing, an analysis of equal pay for men and women, an analysis of monetarism, an analysis of buffer stocks, the economics of patents, licences and innovations, an analysis of legal and illegal migration, the economics of welfare and reversed international transfers, the monetary approach to the balance of payments, and the monetary approach to the exchange rate.

Four areas of interest and impact were clearly the most important and deserve to be highlighted: (*a*) the pure theory of international trade, (*b*) macroeconomics, (*c*) international monetary theory, and (*d*) economic policies and issues of political economy.

Johnson's work on trade theory constitutes perhaps his most important scientific contribution. His early work in this area is collected in *International Trade and Economic Growth* (1958). This book contains his important and highly original papers in the theory of trade and growth (1953a, 1954). These articles, written at the time of the dollar shortage after the war, were to address the issues from the viewpoint of differential growth of productivity among trading countries, and were to put the whole theoretical discussion into a form that dominated the work of trade theorists for years.

His writings on the general equilibrium analysis of international trade include two influential companion papers on income distribution (1959b, 1960b). In addition, among his notable contributions are those that belong to what James Meade called the theory of trade and welfare. Four are particularly noteworthy. In chronological order, these are: his classic paper (1953b) on optimum tariffs and retaliation; the cost of protection and the scientific tariff (1960a), building on his earlier work measuring the gains from trade; optimal trade interventions in the presence of domestic distortions (1965a); and the possibility of income losses from economic growth of a small, tariff-distorted economy (1967d).

The paper on optimum tariffs and retaliation addresses the issue of whether a large country which exercises its monopoly power can be made worse off because of foreign retaliatory tariffs. Using a Cournot-type retaliation mechanism, Johnson showed that the country that initially imposes an optimal tariff can wind up better off than under free trade despite foreign tariff retaliation. From the viewpoint of Johnson's evolution as an economist, this paper is notable for two things. First, the early vintage Johnson was intrigued by analytical complexities of the kind that he found much less interesting later. Second, the policy implication of this early vintage analysis was to resurrect the classic case for the exercise of monopoly power by a large country; Johnson's later writings tended to go in the opposite direction, highlighting the great potential cost of departing from truly free trade.

The shift in Johnson's emphasis to the advantages of free trade is seen most directly in his work on the theory of optimal policy intervention in the presence of distortions and in his work on the theory of immiserizing growth. In both instances, Johnson opposed the use of tariffs, utilizing the insights of the theory of second best as applied to problems of trade and welfare.

Finally, the impact of Johnson's paper on the scientific tariff (1960b) was in two areas: (*a*) the measurement of the cost of protection and (*b*) the analytical propositions regarding optimal tariff structures. Johnson's theoretical contributions influenced empirical work on measuring the cost of protection, and on measuring the gains or losses to Britain from joining the EEC. Many of his contributions to the theory of tariffs and commercial policy are reprinted in his *Aspects of the Theory of Tariffs* (1971a).

Johnson's early contributions to macroeconomics were made during his tenure at

Cambridge. In 'Some Cambridge Controversies in Monetary Theory' (1951b) he clarified the essence of the controversy between the Keynesian and the Robertsonian approaches to key issues like loanable funds versus liquidity preference, the savings–investment identity and the Gibson paradox, and he clearly demonstrated his talent for distilling and integrating complex issues into a coherent framework. His major contributions during that period, however, were his study of the implications of secular changes in the UK banks' assets and liabilities consequent on the replacement of private by public debt (1951a) and his active participation in the discussion surrounding the revival of monetary policy in the UK. Johnson was critical of the quality of British monetary statistics and in a series of articles attempted to make the case that improved monetary statistics were essential for well managed monetary policy. In 'British Monetary Statistics' (1959a) he published his own labouriously constructed monetary aggregates for the period 1930–57, which stimulated further research.

Johnson's move to the University of Chicago (to which he was invited as the 'Keynesian') marked an increased research interest in monetary theory. His major contributions in the early 1960s are 'The *General Theory* After Twenty Five Years' (1961), the survey article 'Monetary Theory and Policy' (1962b) and 'Recent Developments in Monetary Theory' (1963a). These three contributions have since become classics in the field of monetary economics. They established Johnson's reputation as a scholar with a rare breadth of knowledge and with broad scientific and historical perspectives. The survey article is widely acclaimed as a masterpiece in scholarship and its contribution went far beyond surveying the 'state of the art'. Johnson's survey suggested a list of issues that would benefit from further research. In retrospect, this list seems to have served as the research agenda in the subsequent 15 years. One of the notable issues on the list was his early scepticism on the stability of the Phillips curve in the face of changes in macroeconomic policies. His evaluations of the major developments in monetary economics (as of the early 1960s) have been influential and perceptive. These developments were the application of capital theory to monetary theory and the shift from static analysis to dynamic analysis. These contributions, along with others, are reprinted in *Money, Trade and Economic Growth* (1962c) and *Essays in Monetary Economics* (1967b) that also include his important contributions to the topic of money and economic growth.

As a result of his interest in the Keynesian revolution and his deep historical perspective, Johnson wrote his controversial article 'The Keynesian Revolution and the Monetarist Counter-Revolution' (1971b) which was first presented as the Richard T. Ely Lecture in 1970 and was reprinted in his *Further Essays in Monetary Economics* (1972a). This article is an exercise in the history of economic thought and scientific evolution. His interest in the various aspects of Keynes and his economic thought resulted in a series of provocative articles, some of which appeared posthumously in his joint book with his wife Elizabeth Johnson, *The Shadow of Keynes* (1978b).

Johnson's major criticism of the Keynesian model was its failure to deal with the problem of inflation at the levels of both economic theory and economic policy. He was critical of the 'sociological' non-economic theories of inflation, as well as of price controls and incomes policy as remedies for inflation. His analysis of inflation was approached from the perspective of an international economist who views inflation (under a fixed exchange rate regime) as a global phenomenon, a proper analysis of which requires a shift of focus from the concept of monetary developments in individual countries to the concept of the aggregate world money supply. Johnson's view of world inflation is best exemplified in his *Inflation and the Monetarist Controversy* (1972b) which was delivered as the De Vries Lecture in 1971.

Throughout his professional life, Johnson continued his research on international monetary economics. Three articles in 1950 set the stage for what later on became the typical characteristics of his style of research: courage to take positions not always popular with others, the application of relatively simple economic techniques to a new range of problems with resultant important

insights, and a passion for geometry as a tool of analysis. He took an early stand against raising the price of gold in terms of all other currencies (1950a), analysed the destabilizing effect of international commodity agreements on the prices of primary products (1950b) and produced an early diagrammatic analysis of income variations and the balance of payments (1950c) – an analysis which was conducted within the then typical Keynesian framework, a framework which he later criticized.

In his writings on the theory of the transfer problem, originally developed in the context of the post-war reparations, Johnson extended earlier work by P.A. Samuelson, L.A. Metzler, F. Machlup and J.E. Meade and demonstrated the potential provided by his philosophy that individual research effort is most productive when it utilizes the work of previous theorists as a foundation for new construction.

Johnson's theme was that of 'continuity and multiplicity of effort'. In 'The Transfer Problem and Exchange Stability' (1956) he demonstrated that the problems of transfers and of exchange stability are formally the same and that all the possible methods of correcting balance of payments disequilibrium can be posed in terms of the analytical apparatus of the transfer problem. Almost two decades later (1974) he returned to the analysis of transfers with greater emphasis on the monetary aspects of the problem.

Johnson's most important contribution to the understanding of international monetary economics is 'Towards a General Theory of the Balance of Payments' printed in his *International Trade and Economic Growth* (1958). His insight was the emphasis on the monetary nature of a balance of payments surplus or deficit. '[A] balance-of-payments deficit implies *either* dishoarding by residents, *or* credit creation by the monetary authorities'; the former is inherently transitory and the latter is policy induced. As for policy, Johnson coined the distinction between 'expenditure reducing' policies and 'expenditure switching' policies. The insights contained in this important article are all the more remarkable considering the intellectual environment in the mid-1950s where to a large extent the balance of payments was viewed as a 'real' (in contrast with 'monetary') phenomenon. This article may be viewed as the intellectual precursor of what would be termed 15 years later 'the monetary approach to the balance of payments'.

Over the years, Johnson focused increasingly on policy issues with special reference to Canada (1962a, 1963b, 1965c). He supported the move to a flexible exchange rate regime (1969) but recognized, relying on the theory of optimum currency areas, that there are circumstances under which a small country (like Panama) might be better off maintaining a fixed parity.

His analysis of the international monetary system revealed his strength as a realistic political scientist. Monetary reform is not carried out in a vacuum. It is performed by representatives of independent nation states, to whom international commitments are likely to be secondary to national commitments. This view is reflected in his numerous commentaries on international monetary crises, in his doubts about the prospects of a stable European monetary union, in his appraisal of the Bretton Woods system and in his perceptive article 'Political Economy Aspects of International Monetary Reform' (1972d). He took a hard line on schemes designed to solve the international monetary problems by methods that channel resources to the less developed countries. He was aware that such a stance might be unpopular but his professional integrity determined his position; in his words, 'My reason for refusing to endorse such schemes is not that I am opposed to the less developed countries receiving more development assistance but I think that no useful purpose is served by misapplying economic analysis for political ends' (1967a, p. 8).

As world inflation accelerated in the 1960s Johnson recognized that in a world integrated through international trade in goods and assets, national rates of inflation cannot be fully analysed without a global perspective:

> I have become increasingly impressed in recent years with the conviction that the traditional division between closed-economy and open-economy monetary theory is a barrier to clear thought, and that domestic monetary phenomena for most of the

> countries with which economists are concerned can only be understood in an international monetary context. (1972a, p. 11)

This perception of world inflation along with the analytical insights from his earlier work 'Towards a General Theory of the Balance of Payments' (printed in 1958) paved the way to his work on the monetary approach to the balance of payments which he viewed as the crowning achievement of his career. The intellectual roots of the monetary approach go back to the classic writers (David Hume and David Ricardo) and its early developments can be found in the work of economists associated with the International Monetary Fund (for example, Jacques Polak). Johnson, however, along with Robert A. Mundell and other members of the International Economics Workshop at the University of Chicago, introduced new and significant dimensions to the approach. Noting that the balance of payments is essentially a monetary phenomenon, he concluded that balance of payments policies will not produce an inflow of international reserves unless they increase the quantity of money demanded or unless domestic credit policy forces the resident population to acquire the extra money wanted through the balance of payments via an excess of receipts over payments. He saw himself as a missionary; and he was to take the lead in developing and disseminating the approach by encouraging and at times guiding the theoretical and empirical research in this field in various centres such as Chicago, London and Geneva. He co-edited with J. A. Frenkel some of the results in *The Monetary Approach to the Balance of Payments* (1976). The evolution of the international monetary system into a regime of flexible exchange rates led to further extensions of the monetary approach and resulted in a new direction of theoretical and empirical research on the economics of exchange rates. Johnson stimulated much of the early research in the area and co-edited with J. A. Frenkel *The Economics of Exchange Rates* (1978) which contains some of the resulting work.

In addition to his theoretical contributions, Johnson wrote profusely also on policy matters. His *Economic Policies Toward Less Developed Countries* (1967a) analyses proposals such as commodity schemes and preferential entry for manufactured exports of the less developed countries. Similarly, his work on the brain drain (1964, 1967c) propounded the view that the brain drain might be welfare-improving for the countries from which it occurred. This is one example of how, in his later years, his analyses increasingly questioned interventionist policies. Thus, the brain drain was beneficial rather than harmful; the multinational corporations were part of a non-zero-sum game and so on. The United Nations Conference on Trade and Development (UNCTAD), which addresses the less-developed countries' problems and demands, and which he had looked on rather benignly in the early 1960s, came under his criticism in several writings as he came to feel that professional economists had allowed themselves to be influenced by their sympathies for the poor countries to the point of being led into empathetic and non-scientific research on trade and development.

It is impossible to conclude the brief survey of Johnson's prolific research without highlighting three other important aspects of his contribution. First, he was a humane social scientist who was interested in understanding social phenomena, in contributing to the improvement of welfare, and in understanding the development of knowledge and technological advances. These qualities are particularly evident in his *On Economics and Society* (1975a) and in *Technology and Economic Interdependence* (1975b). Second, he was a gifted teacher with a deep sense of mission and responsibility. He devoted great effort to the preparation of his lectures and always undertook an extremely heavy teaching load. Some of his lucid and insightful lectures are published in *Macroeconomics and Monetary Theory* (1972c) and *The Theory of Income Distribution* (1973). Third, he was widely respected as an editor, who demonstrated both considerable judgement and a talent for recognizing and encouraging the development of new and original lines of thought. He was devoted to his

sustained role as an editor of the *Journal of Political Economy*. He also served on the editorial boards of the *Review of Economic Studies, Economica*, the *Journal of International Economics* and *The Manchester School of Economic and Social Research*.

Testifying to Johnson's impact on the economics profession is the number of articles devoted to the evaluation of his scientific contributions. Noteworthy in this respect are the special issues of the *Canadian Journal of Economics* (1978) and the *Journal of Political Economy* (1984) (which also contain a complete bibliography of Johnson's voluminous writings), as well as the entry in the *International Encyclopedia of the Social Sciences* (Bhagwati and Frenkel 1979), on which this present article draws.

Many honours came Johnson's way. He was invited to deliver many of the prestigious public lectures in economics: the Ely Lecture, the Wicksell Lectures, the De Vries Lecture, the Ramaswami Lecture, the Johansen Lectures and the Horowitz Lectures. He was elected to the presidency of the Canadian Political Science Association (1965–6) and the Eastern Economic Association (1976–7), was Chairman of the (British) Association of University Teachers in Economics (1968–71), and was Vice-President of the American Economic Association (1976). He was a Fellow of the Econometric Society, the British Academy, the Royal Society of Canada, the American Academy of Arts and Sciences, a Distinguished Fellow of the American Economic Association and an honorary member of the Japan Economic Research Center. He was the holder of honorary degrees from St. Francis Xavier University, University of Windsor, Queen's University, Carleton University, University of Western Ontario, Sheffield University and the University of Manchester, and he was awarded the Innis-Gérin Medal of the Royal Society of Canada, the Prix Mondial Messim Habif by the University of Geneva, and the Bernhard Harris Prize by the University of Kiel, Germany, just prior to his untimely death. The Canadian government named him an Officer of the Order of Canada in December 1976: a fitting tribute from his native country for a fully internationalist economist who had brought great distinction to his profession and his discipline.

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Johnson, William Ernest (1858–1931)

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JEL Classifications

B31

English logician, philosopher, and economic theorist. The son of the headmaster of Llandaff House, a Cambridge academy, Johnson entered King's College in 1879 on a mathematical scholarship (11th Wrangler, Mathematics Tripos 1882; First Class Honours, Moral Sciences Tripos 1883). Initially a mathematics coach, then lecturer on psychology and education at the Cambridge Women's Training College, Johnson later held a succession of temporary positions at Cambridge (University Teacher in the Theory of Education, 1893 to 1898; University Lecturer in Moral Science, 1896 to 1901), until he was elected a Fellow of King's College in 1902 and appointed Sidgwick Lecturer in Moral Science in the University, where he remained until his death.

In the Cambridge of Johnson's day, economics was included among the moral sciences and, as C.D. Broad remarks, 'it was a subject in which Johnson's mathematical, logical, and psychological interests could combine with the happiest results' (Broad 1931, pp. 500–1). Although he lectured on mathematical economics for many years, Johnson wrote only three papers on economics (1891; 1894; 1913), of which only the last, 'The Pure Theory of Utility Curves', was published during his lifetime. This latter was, however, an important paper, representing 'a considerable advance in the development of utility theory' (Baumol and Goldfeld 1968, p. 96), and 'contains several results that should secure for its author a place in any history of our science' (Schumpeter 1954, p. 1063n). These include an analysis of utility based on marginal utility ratios, and a proof of the consistency of expenditure and convex indifference curves.

Johnson's aversion to publication has been variously ascribed to his 'ill health, diffidence, and a very high standard of achievement' (Broad 1931, p. 505), and a 'rooted antipathy to publish anything until he was sure of everything' (Braithwaite 1931). Indeed, between the publication of his treatise on *Trigonometry* in 1888, and his three volume work on *Logic* in the 1920s, he published only three papers on logic (1892; 1900; 1918) in addition to his paper on utility. Despite such a limited output Johnson retained his fellowship at King's (the continuance of which was periodically reviewed), due to the high regard in which he was held by his colleagues.

Johnson nevertheless exerted considerable influence on his colleagues and students at Cambridge through his lectures and personal interaction. One example, among many, is John Neville Keynes, the father of John Maynard Keynes and an eminent logician in his own right. When the senior Keynes was at work on the successive editions of his *Studies and Exercises in Formal Logic,* Johnson would come to lunch regularly to discuss the work; one result was that among the examples at the ends of chapters 'the hardest, neatest, and most ingenious problems are marked "J", which means that they were devised by Johnson' (Broad 1931, p. 504). Among his students were John Maynard Keynes, Frank Ramsey, Ludwig Wittgenstein, C.D. Broad and Dorothy Wrinch (an early collaborator of Harold Jeffreys).

Nevertheless, it was only after the publication of his three-volume *Logic* (1921; 1922; 1924) – written only after the encouragement and assistance of his students, in particular Naomi Bentwich – that Johnson gained recognition outside Cambridge: honorary degrees from Manchester (1922) and Aberdeen (1926), and membership of the British Academy (1923). The third volume of the *Logic* concludes with a remarkable appendix on 'education', in which Johnson introduced his 'combination' and 'permutation' postulates. The latter of these was none other than the concept of exchangeability, soon to

be independently rediscovered by Haag and de Finetti, and employed by the latter as a key element in his theory of subjective probability and statistical inference (Dale 1985).

Johnson was one of a remarkable group of English intellectuals – most notably Jevons, Edgeworth, Keynes and Ramsey – who combined in varying proportions interests in economic theory and the philosophical foundations of logic, probability, statistics, and scientific inference. For further biographical details, see the obituary notices by C.D. Broad (1931), R.B. Braithwaite (1931); the unsigned A.D. (1932); and the entry on Johnson by Braithwaite (1949) in the *Dictionary of National Biography 1931–1940.* R.F. Harrod (1951) contains scattered references to Johnson.

Johnson's three papers on economics are reprinted, with brief commentary, in William J. Baumol and Stephen N. Goldfeld (1968). The 1891 and 1894 papers were printed for private circulation, and are virtually unobtainable elsewhere. For a critical discussion of the 1913 paper, see F.Y. Edgeworth (1915). Due in part to what George Stigler has termed Johnson's 'concise and peculiar' style, and in part to the appearance of Slutsky's classic paper two years after the appearance of Johnson's *Economic Journal* paper, there has never been widespread recognition of Johnson's achievement in utility theory, and references to his work in the economic literature are few, brief, and scattered; see, for example Joseph A. Schumpeter (1954).

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In addition to the above, Johnson wrote several critical reviews and a note for *Mind* during the years between 1886 and 1890, and contributed several entries to the original *Palgrave.*

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Joint Production

M. Ishaq Nadiri

The network of cost relationships in a multi-product firm is much more complicated than in a single product one and the nature of these relationships has important implications for the structure and size of the firm, the organization and regulation of the industry, and the pattern and intensity of resource employment. The general neoclassical multi-product/multi-input decision framework presupposes that the firm is producing more than one output, but the central question is why do firms diversify into multiple outputs. The answer may lie in the characteristics of the cost functions and the nature of the demand facing the firm. We shall therefore briefly discuss: (1) the main causes of joint production; (2) the econometric techniques proposed for testing the presence of joint production and (3) the implication of joint production for the organization of the industry.

Cause of Joint Production

Joint production includes two cases: (1) when there are multiple products, each produced under separate production processes – i.e. the production function is non-joint; and (2) when several outputs are produced from a single production process. In the first case 'joint production' is a problem of aggregation while in the second case it is a technological phenomenon of 'intrinsic jointness'. Thus, writing a production or cost function with several outputs is by itself not an evidence of joint production; it is the absence of non-jointness which is a crucial test.

Recent literature has identified a variety of reasons for joint production but three causes stand out: economizing of some shareable inputs or economies of scope; jointness due to output interactions; and uncertainty on the demand side.

1. *Economies of scope*. Suppose that a vector of outputs $y = (y_1,\ldots,y_n)$ and a vector of primary inputs $x = (x_1,\ldots,x_m)$ are technically related by the production structure characterized by its dual, the joint cost function $C = g(w, y)$ where $w = (w_1,\ldots,w_n)$ is the vector of input prices. Further assume that the cost function is *non-additive* with respect to all partitions of the commodity set. Economy of scope is defined for the partition of commodity set, h, as

$$\sum_{h=1}^{s} C(y_h, w) < \sum_{j=1}^{m} \left[C\left(y_j, w\right) \right],$$
$$y_j = \left(0, \ldots, y_j, \ldots, 0\right), \text{ if } s < m$$

where $\Sigma C(y_j, w)$ is the total cost when each commodity is produced separately (Lloyd 1983). Economies (diseconomies) of scope will exist by this definition for *a given* partition of commodities.

Economies of scope may arise from fixed inputs such as physical and human capital that are shared or utilized without complete congestion. Some fixed inputs may be imperfectly divisible and could not easily be shifted from one production to another so that the production of a subset of commodities may leave excess capacity in some stage of production. Another possibility is that some of the inputs may have a quasi-public characteristic which when purchased for use in one production process can be at least partically used in the production of other commodities.
2. Economies of scope may also be due to interrelationships among products: two or more commodities may be produced jointly, at lower cost than if they were produced separately even in the absence of excess capacity and shareable inputs in the production process. An example will be a production process

where $y_1 = f(x)$ but $y_2 = f_2(x, y_1)$) which characterizes many industrial and agricultural production processes. Another example is the case where it is not possible to produce zero quantities of the commodities produced jointly, i.e. the multiple output–input function $F(y, x) = 0$ is restricted to the combination (y, x) that precludes any element of the output vector y to be zero. Examples of such production can be found in agriculture (wool and mutton) and some chemical processes.

3. Demand conditions are also important for the product structure of the firms; firms may avoid declines in revenue because of market saturation by producing new products, thereby substituting economies of scope for the economies of scale that the firm cannot achieve given the market conditions it faces. Another reason for joint output is attributed to uncertainty and risk aversion (Lloyd 1983). Firms choose commodity diversification as a strategy to reduce risk in an environment of uncertainty though no jointness exists in their production process. Suppose a firm's profits from each commodity is random because the output and input prices are random variables; the firm maximizes the expected utility of aggregate profit given the joint probability distribution of the random variables. Under these sets of assumptions the firm will produce multiple outputs even though there is no technological reason for doing so. The presence of uncertainty plays the same role as shareability of input or intrinsic jointness of output in generating economies of scope.

Econometrics of Joint Production

A major problem has been the difficulty of specifying a sensible and estimable functional form for the multi-product technology. The flexible functional form developed by Christensen et al. (1973), Diewert (1971), and Lau (1978) has made it possible to use the flexible production or cost functions, and particularly the translog cost or profit functions, to approximate multiple output technology. Other more suitable joint cost functions can be formulated but since the translog cost function is often used in empirical studies, we employ it for illustrative purposes. Consider the cost function

$$\begin{aligned} \ln C = {} & \alpha_0 + \sum_i \alpha_i \ln w_i + \sum_k \beta_k \ln y_k \\ & + \frac{1}{2} \sum_i \sum_j \gamma_{ij} \ln w_i \ln w_j \\ & + \frac{1}{2} \sum_k \sum_l \theta_{lk} \ln y_1 \cdot \ln y_2 \\ & + \sum_{ik} \sum_{ik} \delta_{ik} \ln w_i \ln y_k \\ & i, j = 1, \ldots, m, \quad k, l = 1, \ldots, n \end{aligned} \tag{1}$$

which is a quadratic approximation to an arbitrary multiple output cost function. The nature of the cost relationships can be tested by imposing the necessary parameter restrictions. For example, if it turns out that $\delta_{ik} \cdot \beta_l = \delta_{il} \cdot \beta_k$, then the cost function is separable, i.e. the ratio of any two marginal costs is independent of factor prices or factor intensities; then the cost function can be written as $C(y, w) = H(y)\ \omega(w)$. Another important feature of the production structure is non-jointness which is that total cost of producing all outputs be the same as the sum of the cost of producing each output separately, i.e., $C(y, w) = \Sigma_i g_i(w, y_i)$. This implies that the marginal cost of each output is independent of the level of any output. In terms of (1) the condition of non-jointness is $\theta_{kl} = -\beta_k \beta_l$ for $k \neq l$. Hall (1972) has shown that no multiple output technology with constant return to scale can be both separable and nonjoint; in fact all nontrivial separable technologies are inherently joint and cannot be used empirically to test hypotheses about jointness.

Ordinary translog cost function (1) (and cost function with logarithmic output variables) is inappropriate to measure economies of scope. By definition, if any of the outputs is zero the multiple product firm's cost will be zero, which suggests that if a firm specializes completely in one of the outputs it must incur no costs whatsoever. To overcome this problem it is necessary to modify (1) by performing a Box-Cox transformation on output variables, i.e. substitute

$y^* = (y^\lambda - 1/\lambda)$, where λ is a parameter to be estimated. Another possibility is to formulate alternative cost functions such as the linear generalized Leontief joint cost function proposed by Hall (1972) or the CES multiple output cost function stated in the next section. Both are well defined for zero output levels.

Note two other issues: when allocatable fixed inputs are the sole cause of jointness the dual production models (multi-product costs or profit functions) are not very useful because they can recover the production function in the *sum* of the inputs and not in terms of individual allocations. This arises because all of the input allocations have the same market price, which enters the cost and profit functions. Appropriately specified *primal* model would permit identification of such allocations (Shumway et al. 1984). Also, a Giffen effect may arise in the case of multiproduct production. As the direct substitution effect of a change in price may not be negative for a factor in a single product line, although it will be over all lines. Moreover, the cross-substitution effect may not be equal in an individual product line (Hughes 1981).

The measures of economies of scale and scope are, respectively.

$$S = \sum_{k=1}^{n} \left(\frac{\partial \log C}{\partial \log y_k^*} \right)^{-1}$$

and

$$S_c = \frac{C(y_1^*, 0) + \cdots + C(0, y_n^*) - C(y_1^*, \ldots, y_n^*)}{C(y_1^*, \ldots, y_n^*)}$$

and the relationship between them is shown to be

$$S = \frac{\sum_{i}^{n} \beta_i S_i}{1 - S_c} \quad \text{and} \quad \sum \beta_i = 1, \quad i = 1, \ldots, n$$

where S_i are measures of product specific economies of scale and β_i are roughly equal to the share of the variable cost of producing each output. If there is a sufficiently large economy of scope, it could result in economies of scale on the entire product set even if there is a constant return or some degree of diseconomies of scale in the separate products.

A number of econometric studies summarized by Bailey and Friedlaender (1982) and those by Denny and Pinto (1978), Brown et al. (1979), Griffin (1977), Vincent et al. (1980), Just et al. (1983), and others have shown that at industry level (particularly in agriculture) multiple output production technologies prevail with differing degrees of jointness and economies of scope. However, further studies are required. Particularly, the role of technological progress in changing the intertemporal structure of the cost relations by unbundling some joint costs and giving rise to new ones requires considerable attention.

Industry Structure

Multi-product technology has important implications for the organization and regulation of industry. The characteristics of the underlying cost relationships could determine the optimal number of firms that may populate an industry; the industry may be dominated entirely by a single firm producing all of the output or may be characterized by duopolistic, oligopolistic or competitive forms. Baumol (1977) among others has formulated conditions for natural monopoly to prevail. When the cost function is *subadditive* the efficient supply condition is a single firm that can produce industry output at lower costs than two or more firms. The degree of contestability in many multiproduct industries depends to a great extent on the nature of the multiple output cost function. For example, consider the cost function

$$C(y_1, \ldots, y_n) = F + \left[\sum_{i=1}^{n} (y_i / a_i)^{\beta} \right]^{1/\alpha\beta} \qquad (2)$$

where $F \geq 0$ is the fixed cost. Depending on the parameter values of (2) four market structure possibilities can be identified: (1) if ($F \geq 0$, $\alpha < 1$, $\beta > (1/\alpha;)$), the industry is a natural monopoly; (2) if ($F = 0$, $\alpha < 1$, β arbitrary), the industry is competitive; (3) if ($F = 0$, $\alpha > 1$, $\beta < (1/\alpha)$),

n specialized firms each producing the industry output of the specialized good will constitute the industry; (4) finally, if ($F > 0$, $\alpha < 1$, β arbitrary), at *small* levels of output, either a single firm ($\beta > 1$) or a number of specialized firms ($\beta < 1$) will populate the industry while at *large* levels of output, several smaller specialized firms will constitute the industry. Similar experiments can be carried out with the modified translog cost function (1).

The degree of contestability deduced from the characteristics of the cost relations (given sustainable prices) has policy implications for the entry of new firms, the degree of concentration in a market, and antitrust laws. In contestable markets, mergers may not be anticompetitive; the theory of joint production is also important for considering the boundary issue between regulated and unregulated portions of an industry and the related problem of cross-subsidization. Another policy concern is the potential pathological substitution effects in multiple-production processes that, at least in the short run, may lead to possible bottlenecks in factor utilization and may to some extent negate the effect of particular policies.

See Also

- ▶ Cost and Supply Curves
- ▶ Cost Functions
- ▶ Duality
- ▶ von Neumann Technology

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Joint Production in Linear Models

Bertram Schefold

General *joint production* is defined as the simultaneous production of at least two commodities in one production process. This definition includes machines (fixed capital) that are not used up in one production period, and land which is by definition neither producible nor exhaustible.

Models are called *linear* in economic theory if a linear technology is used (implying constant returns to scale) and a finite number of production

processes to produce a given number of goods. However, the classical theory, particularly in its modern form (Sraffa), does not presuppose constant returns; yet the formal tools of analysis are similar to those used in neoclassical theory in the linear case which justifies the inclusion of Sraffa below.

Linear models, as discussed here with regard to joint production, will be classified as (I) input–output models; (II) Von Neumann and Activity Analysis Models; and (III) Sraffa Models.

Joint Production in Input–Output Analysis

The most widely used linear model in modern economics is undoubtedly Leontief's inputoutput model (see Leontief 1936). As a theoretical model, it rules out joint production. In applied economics, joint production is found to be a ubiquitous phenomenon, and the methods used to cope with it are remarkable for their diversity. Hence, in applied inputoutput analysis one commonly aggregates or transforms industries and commodities in such a way that joint production does not appear. There are few publications which give a theoretical background to these constructions. Frequently joint production is discussed under the topic of 'secondary production' (see e.g. Armstrong 1975; Chakraborty et al. 1984; Flaschel 1983, pp. 333–58; Flaschel 1982b; Gigantes 1970; Stone 1961). One usually assumes that there is a square matrix, the so-called 'use matrix', $Z = (z_{ij})$, where z_{ij} represents the quantity of a commodity i (rows) used in industry j (columns), and a square matrix $X = (x_{ij})$, often called 'make matrix', which represents the amount of the products j produced in each industry i, $i, j = 1, \ldots, n$. X is separated into X_1, and X_2, where for X_1 all non-diagonal elements are zero. *X_1 has the 'main products' on the diagonal. Several ways of dealing with 'by-products' shown in $X_2 = X - X_1$* have been suggested and used with the data to define an input–output matrix A.

(a) The *commodity technology model* simply assumes that an ascription of individual costs to commodities is possible and that one industry for each commodity is generated. Formally, the ascription is given by $A = Z(X')^{-1}$, where X' is the transposed matrix of X. (The matrix has to be transposed because the rows of the make matrix represent processes while the opposite convention is used for the use matrix). This model is used in applied inputoutput accounting (see e.g. UN 1968, pp. 25–51). The assumption that the number of commodities equals the number of industries is essential here. Note that negative elements of the input–output matrix may occur.

(b) The *industry technology model* supposes that the technology is determined by the industry and that there exists a fixed commodity market share of each industry. Mathematically this model can be presented as follows:

$$A = [a_{ij}];$$
$$a_{ij} = \sum_{k=1}^{n} \left(x_{kj} / \sum_{l=1}^{n} x_{lj} \right) \left(z_{ik} / \sum_{l=1}^{n} x_{kl} \right)$$
$$A = Z\left(\overline{Xe}\right)^{-1} X \left(\overline{X'e}\right)^{-1}$$

or

$$A = Z\left(\overline{Xe}\right)^{-1} X \left(\overline{X'e}\right)^{-1},$$

where $\overline{Xe}\,(\overline{Xe'})$ is the diagonal matrix of vector Xe $(X'e)$ and where $e' = (1, 1, \ldots, 1)$. This model is often thought to deal adequately with joint production. It is said that it can be extended to cover the case where the number of commodities exceeds the number of industries and has been applied by the Bureau of Economic Analysis (US Department of Commerce 1980, pp. 37–51). It has, however, recently been attacked as being dependent on the base year prices chosen and on the distribution of the value added (see Chakraborty et al. 1984, pp. 89–90).

(c) The *by-product model* assumes that each industry produces outputs in fixed proportion and that one can say which of these outputs is

the main one. The secondary products are then treated as negative inputs. Hence $Z - (X_2)' = AX_1$, $A = [Z - (X_2)']\ (X_1)^{-1}$. It is again essential that the number of commodities equals the number of industries. The matrix A may contain negative elements (see Stone 1961, pp. 39–40; Chakraborty et al. 1984, p. 88).

(d) Gigantes (1970) and Chakraborty et al. (1984) distinguish between '*ordinary secondary products*' and '*by-products*'. In the case of 'ordinary secondary production' the application of the commodity technology model (case (a)) was proposed by both. While, however, Gigantes applied the industry technology model (case (b)) to by-products, Chakraborty et al. used the by-product model (case (c)) because of the deficiencies of the industry model pointed out by them.

(e) If the product is thought to be such that it is not the main product of any process it cannot be allocated to any industry of the economy as its single product. A *dummy industry* should then be introduced according to Stone (1961, pp. 41–2) which uses no input and shows the secondary product as output.

(f) Besides these constructs there are other models. For example, the Bureau of Economic Analysis supposed that, as in cases (a) and (c), to each by-product of an industry there is another industry of which that commodity is the main product. The amount of the commodity produced as a by-product is treated as if it were bought by the industry where it is the main product and added to the output of that industry (see US Department of Commerce 1974).

All procedures have in common that they result in a system in which the number of processes is equal to that of the commodities, and usually it is assumed that the equality already holds at the level of the data, given in the form of square 'use' and 'make' matrices. This corresponds to what one should expect to hold in equilibrium from a classical point of view (Section "Joint Production in SRAFFA Models").

Joint Production in von Neumann Models and Activity Analysis

Joint production was first introduced in a linear model (with balanced growth and constant returns to scale) by John von Neumann (1937). In von Neumann models, joint production includes fixed capital but excludes land. The vast literature on the model (see Morishima 1964) did not lead to a systematic analysis of different forms of joint production as special cases. Even the treatment of fixed capital as a joint product was first misunderstood; if a_{ij} is the input of a machine which depreciates by 10 per cent, it was thought that the output was $b_{ij} = 0.9\ a_{ij}$ (see Dorfman et al. 1958, pp. 382–3) while it is now generally accepted that the advantage of the joint production approach to fixed capital is based on the possibility of treating the old machine leaving a process as a different good from the one entering it so that depreciation has to be determined simultaneously with prices. Because von Neumann postulated that the rate of interest (or profit) is uniform and to be minimized and that the rate of balanced growth in the dual is maximized and equal to the rate of interest, the model chooses in general (but not always) $k \leq m$ production processes to be activated or $k \leq n$ positively priced commodities. The other $m-k$ processes (or $n-k$ commodities) are not used (or not produced). For the $m-k$ processes are not profitable and the quantities of $n-k$ commodities are overproduced and can be disposed of, that is, the prices of these will be zero. Therefore this model can also be a theoretical justification for the assumption mentioned above of a square 'make matrix' used in input–output analysis (see von Neumann 1937; Schefold 1978b, 1980a).

A similar argument was presented by Koopmans (1951) in his activity analysis. He studied the set of all possible baskets of commodities which are producible from efficient production processes. Like von Neumann he presupposed in his model constant returns to scale and that joint products which are socially not wanted and overproduced can be disposed at zero cost. Nevertheless, he considered briefly the problems that there might exist unwanted

commodities which are necessarily produced along with the other socially desired ones. If the former endanger the consumption of the latter, they should be destroyed or transformed into desired commodities by additional processes. But the 'usefulness' will depend on the prices that result from the price determination of the whole economic system. Positively priced commodities are called 'useful'. If one assumes a linear objective function which chooses one technology out of the set of efficient technologies one will almost always obtain an economic system where the number of processes equals the number of commodities.

Activity analysis is much simpler in the case of single production where the so-called 'non-substitution theorem' holds: assuming (1) constant returns to scale, (2) a finite number of activities available to produce each commodity in a single product process by means of other commodities and labour, and (3) a uniform rate of profit, one particular combination of activities will yield the highest rate of profit, given the real wage (or, conversely, yield a higher real wage, given the rate of profit), *independently of the composition of output.* Prices will be positive if the economy produces a surplus of aggregate outputs over inputs and if the rate of profit is below the maximum rate of profit at which the entire surplus goes to profits and wages are zero. Formally $(1 + r)$ $pA + wl = p$, where A is the square input–output matrix which results from the choice of activities, l the labour vector, r the rate of profit, and w the wage rate.

This was called the '*non-substitution theorem*' by neoclassical economists, because prices here appear to be independent of demand changes, given distribution. However, there is really no room for this theorem in neoclassical analysis because a determination of factorinputs and of relative outputs in terms of supply and demand necessarily links distribution with the demand for commodities (Garegnani 1983).

The theorem more naturally corresponds to a classical approach, with prices reflecting costs and distribution being determined through other forces than supply and demand (Sraffa). The extension to joint production then poses a number of problems, in particular regarding the determination of prices. Early marginalists thought (erroneously) that prices of joint products could not be determined within a classical cost of production theory (see Kurz 1984). The solution was provided by Sraffa who found a way to determined relative prices, given distribution, in a classical framework, by starting from square input and output matrices.

Joint Production in SRAFFA Models

Unlike von Neumann, Koopmans, and Leontief, Sraffa (1960) did not assume constant returns to scale. His theory describes the technology, the composition of output and the state of distribution in a long period equilibrium of a closed economy which produces a surplus to be divided between profits, wages and – in the presence of land – rents. The variation of the activity levels which is essential to Koopmans's, von Neumann's, and Leontief's models was not the object of Sraffa's investigation. Assuming a given uniform rate of profit r, n processes in Sraffa's model determine prices of $n - 1$ commodities and the uniform wage rate w. He introduced joint production mainly but not exclusively because he wanted to consider fixed capital in his system. An industry can then no longer be characterized by the commodity it produces. But the number of industries can be expected to be equal to the number of commodities. For the socially wanted commodity basket is not producible if the number of industries is less than the number of produced commodities. In the converse case, prices would be overdetermined. Sraffa has thus shown that relative prices of joint products can be determined within a classical theory.

The model can be formulated as follows: $(1 + r)Ap + wl = Bp$, where the elements $a_{il},\ldots, a_{in}$, of A, l_i, and $b_{il},\ldots b_{in}$ of B describe the quantities of the means of production, labour used, and the quantities of the produced commodities in the ith industry. Note that processes are now represented by rows and commodities by columns of the matrices A and B, following Sraffa, since the emphasis is on the determination of prices,

given the structure of industries. The elements above can be normalized through $eB = e$ with $e(B - A) \geq 0$ (existence of a surplus), and $el = 1$, where $e = (1,1,\ldots, 1)$.

Some Contrasts Between Single Product and Joint Production Systems

Most of the properties of single product systems do not hold for all possible joint production systems. For it is an essential property only of the former that the commodities are separately producible if one assumes constant returns to scale. With single production, output can adapt to all compositions demanded without changing the processes used (this is again the 'non-substitution theorem'). But in joint production systems there exists in general no vector of activity levels $q_i = e_i(B-A)^{-1}$, $e_t = (0,\ldots, 1,0,\ldots, 0)$, necessary to produce one unit of one of the n commodities without running one of the industries at a negative level. It is, however, possible to single out joint production systems such that $(B - A)^{-1} \geq 0$ (see Schefold 1978a). These systems are called all-productive systems. For if $(B - A)^{-1} \geq 0$, the activity levels are semi-positive ($q_i \geq 0$). If $(B - A)^{-1} \geq 0$, all processes are indispensable and the system is called all-engaging.

One can show that both, single product systems and joint production systems which are all-productive, have one and only one maximum rate of profit and standard commodity, and that prices are positive and rise monotonically in terms of the wage rate between zero and a maximum rate of profit. In general joint production systems, however, none of these properties necessarily holds. On the other hand, one can prove that in every basic (see Section "Basics and Non-Basics in Joint Production Systems") joint production system with a surplus and positive prices at $r = 0$, prices all turn negative and/or a maximum rate of profit will be reached where the wage rate is zero. Hence no basic joint production system is viable for all positive rates of profit.

Prices at $r = 0$ can be interpreted as 'labour values' or 'labour embodied', for if u is a vector of embodied labour, clearly $Au + l = Bu$ must hold. The same magnitudes can also be interpreted as employment multipliers for $u_i = q_i l$, where qi is the vector of activity levels to produce one unit of commodity i in a 'subsystem': $q_i = e(B - A)^{-1}$. Some labour values may, however, be negative (see Sraffa 1960, pp. 59–60; Schefold 1971, pp. 24–6), if the joint production system is not all-productive, though prices at the ruling rate of profit are positive. It will then be possible to expand the system by a small amount without increasing total labour used. For if one assumes a joint production system with $p(r) > 0$, $r > 0$, and $u_i < 0$, producing a surplus $s = e(B - A) \geq 0$ at unit activity levels, ϵq_i, is the vector of activity levels necessary for the additional production of a small amount of the commodity i: $\epsilon q_i = \epsilon e_i(B-A)^{-1}$. Hence the additional necessary 'quantity of labour' is $\epsilon q_i l = \epsilon e_i(B-A)^{-1} l$ or $\epsilon q_i l = \epsilon e_i u < 0$ for $u_i < 0$, while $(e + \epsilon q_i(B - A) = s + \epsilon e_i$, $e + eq_i > 0$ for small ϵ. One can thus save labour by contracting an inefficient process and expanding an efficient one without reducing the surplus.

A reduction to dated quantities of labour analogous to the formula $p = \Sigma_{i=0}^{\infty}(1 + r)^t A^t l$ of single product models is not always possible in joint production systems. Steedman (1976) has shown that in general joint production models positive prices and a positive rate of profit are neither a sufficient nor a necessary condition for Marx's surplus value to be positive. Following this observation, some have begun to regard it as misleading to interpret u as a vector of 'labour values'.

Basics and Non-Basics in Joint Production Systems

In single production systems one can easily differentiate between basics, that is, commodities which are directly or indirectly enter the production of all other commodities, and non-basics. The system will be non-basic if and only if the input–output matrix is decomposable. If we assume joint production, however, a non-basic system is not necessarily decomposable as the following example shows: Consider a basic single product system (A, I, l) with n commodities and n industries. The nth industry of the system produces coke which is supposed to be basic, because it enters the production of steel. If the process produces gas, a by-product, and if we add a

$(n + 1)$st industry which also produces gas and if gas is only sold to consumers, the system remains indecomposable though gas then clearly is non-basic (see Schefold 1971, pp. 7–8).

A system (A, B, l) is called non-basic if a linear combination of processes may be viewed as a decomposable system. Formally, if after a permutation of the columns of A and of B the matrix (A^2, B^2), formed of the last m columns of A and B, has at most rank m. Otherwise the system is called basic. If (A, B) is non-basic, n-m industries have to be linearly dependent on at most m others (Sraffa 1960, pp. 51–2). Without loss of generality, $A_{12} = HA_{22}$ and $B_{12} = HB_{22}$ for some $(m, n-m)$−matrix H (Manara 1968). The system is transformed so that it falls into two parts:

$$\begin{aligned}&(1+r)(A_{11}-HA_{21})p_1 + w(l_1 - Hl_2)\\ &\quad = (B_{11}-HB_{21})p_1, (1+r)(A_{21}p_1 - HA_{22}p_2)\\ &\qquad + wl_2\\ &\quad = \mathrm{B}_{21}p_1 + B_{22}p_2.\end{aligned}$$

According to this rather abstract definition the first part of the equations above can be solved without knowing the second. The basic commodities so obtained are uniquely defined (Schefold 1971, pp. 12–23). The economic meaning is illustrated by the fact that a tax which affects the prices p_2 of the non-basic commodities will not affect the prices p_1 of the basic ones. Other possible distinctions between basics and non-basics were discussed by Schefold (1978a) and Flaschel (1982). For instance, all-engaging systems are always basic in the single product case, but not so with joint production.

Fixed Capital as a Joint Product

Sraffa introduced joint production mainly as a preliminary to the treatment of fixed capital (machines) (Sraffa 1960, p. 43, fn. 1, p. 63). Sraffa assumed machines with constant efficiency, that is, the age of the machine does not affect the amount of the input and output of finished goods and labour. A machine enters the industry in the beginning of one production period as a mean of production and leaves it as a joint product at the end with finished good which was intended to be produced. A finished good may be a consumption good (if not used as input), a new machine (if later transformed into an old one), a spare part (if used as input in conjunction with old machines only), a raw material, or some combination of the above. Sraffa shows that the value of the machines at different ages is dependent on the level of the rate of profit (Sraffa 1960, p. 71). Sraffa's model can easily be extended to a model with machines which change their efficiency with their age (Schefold 1971, pp. 48–80; Baldone 1974; van Schaik 1976). One can show that fixed capital systems, where other forms of joint production and the trade of used machines is excluded, behave very much like single product systems.

Mathematically an economic system with fixed capital of varying efficiency can be formulated with $\Sigma_{i=1}^{n} T_i$ equations: $(1 + r)(a_{it}p_1 + m_{i,\,t-1}p_2) + l_{it}w = b_{it}p_1 + m_{it}p_2$ for all ages $t = 1,\ldots, T_i$ and all industries $i = 1,\ldots, n$. The used machines m_{it}, $1 < t \leq T_i$, with price vector p_2, are produced jointly with a vector b_{it} of finished goods, i.e. new machines and other circulating capital, and consumption goods (price vector p_1). For this the quantities a_{ij}, $j = 1,\ldots, n$, of the commodities, an amount of labour l_{it}, and a one period younger machine $m_{i,\,t-1}$ is required. If $t = 0$ or T_i, $m_{it} = 0$, for new machines belong to finished goods and at the age T_i the machine is used up. Other joint production is excluded by the equations: $b_{ijt} = 0$ for all $i, j = 1,\ldots, n$, $t = 1,\ldots, T_i$, and $i \neq j$. Furthermore the output of final goods is normalized: $\sum_{i} b_{ijt} = 1$. This system of $\Sigma_{i=1}^{n} T_i$ equations can be reduced to a system of n equations by eliminating the used machines: one combines the equations of each industry i by multiplying the ith equation by a factor $(1 + r)^{T_i - t}$ and summing over t for each industry i to get the reduced system:

$$(1+r)A(r)p_1 + wl(r) = B(r)p_1)$$

with

$$A(r) = [a_i(r)] = \left[\sum_{t=1}^{n}(1+r)^{Ti-t}a_{it}\right],$$

$$B(r) = [b_i(r)] = \left[\sum_{t=1}^{Ti}(1+r)^{Ti-t}b_{it}\right],$$

and

$$l(r) = [l_i(r)] = \left[\sum_{t=1}^{n} (1+r)^{Ti-t} l_{it}\right],$$

This system is called an integrated system. It has an intuitive interpretation if the powers of $(1 + r)$ indicate the number of periods which pass between the use of the corresponding inputs (or the production of the outputs) and the end of the lifetime of the machine. The equations of the integrated system therefore show for each machine that total proceeds equal total costs over its lifetime, if one allows for interest at a rate equal to the rate of profit. The existence of the integrated system also shows that fixed capital, apparently a stock, can, in a sense, be reduced to a flow. The fact that it is possible to derive the prices of finished goods within the integrated system proves that prices of finished goods within the integrated system proves that prices of finished goods are determined independently of the existence of markets for old machines.

One can show (Schefold 1971, 1974, 1980b) that in this fixed capital system, which is supposed to be basic, finished goods are separately producible and their prices are positive (exceptions may be due to basic finished goods which are used only as spare parts). All primary processes, except possibly those producing spare parts, are indispensable. A positive maximum rate of profit R and the standard commodity exist. One can also show by induction that: $P_{i0}(r) = \Sigma_{t=1}^{Ti} Y_{it}(1+r)^{-t}$, that is that the price of the new machine $p_{io}(r)$ equals the sum of the discounted 'expected' net returns: $Y_{it} = [b_{it} - (1 + r)a_{it}]p_{1} - wl_{it}$. This equality is usually assumed as an equilibrium condition which links the 'past' with the 'future'. In a fixed capital model, however, this is not an assumption, but a theorem.

Prices of used machines p_2 can also be deduced indirectly through discounting from the integrated system which determines the prices p_1. Since the technical efficiency is allowed to vary with the age of the machines, one is able to describe the falling technical efficiency of a machine growing old, and rising efficiency which occurs, for example, because the machine itself is under construction. Moreover, one can prove: if net returns are positive at all ages of the machine in industry i at the ruling rate of profit r, the prices of the used machine are positive at all ages. If net returns of a machine are negative from age zero to age Θ, $t = 1,\ldots, \Theta$, prices are positive and rising up to age Θ. If a machine has negative returns from age Θ onwards up to age $T_i - 1$, prices are negative no later than at age Θ. If a machine is of falling efficiency, though net returns are positive, prices are falling from age Θ onwards (Schefold 1974, 1980b, pp. 159–60). Note, however, that net returns are dependent upon changes of the rate of profit. It is possible that a machine of rising efficiency turns into a machine with falling efficiency if the rate of profit changes.

Old machines with negative prices can be eliminated by means of truncation (Nuti 1973). If the first and all subsequent processes using an old machine with a negative price are truncated in the production of each finished good, a truncated fixed capital system can be reached such that the real wage is higher and all prices of finished goods in terms of the wage rate are lower at a given rate of profit and such that the processes of the truncated system, if used at prices of the untruncated system, will yield surplus profits during a transition (conversely, losses will be caused if the less efficient methods are used at prices of the efficient ones). This is again independent of the existence of markets for old machines, for the truncation found according to the criterion of the maximisation of the real wage in the integrated system is the same as that found by eliminating machines with negative prices.

Counting of Equations

The classical determination of prices through the structure of production and consumption (given distribution) leads, like input–output analysis dealing with joint production, to square' economic systems with as many commodities (with positive prices) as processes used. The intuitive argument why this should be so has been given above: fewer processes do not in general allow to produce the output in the proportions socially required, more processes lead to an overdetermination of prices.

A more rigorous formal treatment confirms this result for the case of constant returns to scale and balanced growth at a rate equal to the rate of profit (Golden Rule). On can establish an equilibrium with a von Neumann-type model (see section "Joint Production in von Neumann Models and Activity Analysis" above); there results a series of propositions which are analogous to those obtained for fixed capital systems:

Assuming a given basket of goods for final consumption d, square truncated systems can be defined which produce (or overproduce) the given basket at positive activity levels and prices; and optimal solutions (yielding the highest real wage at a given rate of profit) will be found with positive prices. The envelope of the wage curves of the truncations will be monotonically falling. In general, optimal solutions will be 'square systems' (number of commodities with positive prices equal to the number of processes used), and the last truncation appearing on the envelope will in general be all-productive ($[B - (1 + r)A]^{-1} \geq 0$) with a maximum rate of profit and a standard commodity (Schefold 1978b). Much work has recently been done to determine the extent to which these properties also hold if the golden rule assumption is dropped, notably by N. Salvadori (1982) and B. Schefold.

There is a more direct economic argument which shows that 'counting of equations' works in the relevant cases within a classical framework. In fact, a 'square' system results from the forces of competition:

(1) It is true that even with single-product processes one commonly finds that several processes compete at any one moment in the production of the same commodity; these processes usually yield different rates of profit. But the 'socially necessary technique' determines the prices of production at the 'normal' rate of profit, relative to which obsolescent techniques make losses while more advanced ones yield extra profits. The same holds for multi-product industries. An excess of processes will, in the long run and in the absence of technical progress, in both cases be eliminated.

(2) Joint production now gives rise to another possibility: it may appear that there is only one multi-product process, or that there are 'too few', to determine relative prices in the classical fashion; however, it can be shown that incentives for the introduction of 'additional processes' will then arise. If, for instance, a new use is discovered for a byproduct of one process in a system which had been a single-product system, the byproduct can be sold initially (from the point of view of this theory) at an arbitrary price which, if the price is high, may induce the introduction of a second process to manufacture the byproduct in a new process as an output or, if the price is low, to use the byproduct in a new process as an input. In both cases, the number of processes will again be equal to the number of commodities.

In the case of industrial production counting of equations thus leads to the postulate that there should be a second process which produces (or uses!) the byproduct of a process in a different proportion. Overdetermination of prices (too many processes, entailing quasi-rents) and underdetermination (excess of commodities with room left for new processes to be established) are therefore two forms of a disequilibrium which tends to be resolved in a 'square' equilibrium solution much in the same way as market prices tend towards prices of production (Schefold 1985).

(3) The logic of the counting of equations allows one to predict a high degree of specialization in the presence of unproduced means of production. For example, land can be defined as a joint product which leaves a process unchanged (with improvements treated like fixed capital) so that the land price is equal to the rent, capitalized at the ruling rate of profit. There are two main forms of rent: extensive rent where the difference in rent is explained by the difference in production costs between two adjacent lands yielding the same crop, and intensive rent where a cost-intensive and a land-intensive method

may coincide on one land to determine jointly the price (or rent) of the land, and the price of the crop.

Counting of equations shows that most lands will appear to be specialized if different crops could be grown on many lands, but by means of single product processes. For with, say, 10 crops and 100 types of land (differentiated according to location etc.), there will be room for 110 processes determining 100 rents and 10 crops prices, so that at least 90 lands will be specialized (Schefold 1971, pp. 85–6), the choice being influenced by the rate of profit so that it does not necessarily reflect 'open efficiency' or 'fertility'. (Similar arguments can be made if one considers international trade.)

See Also

- ▶ Linear Models
- ▶ von Neumann Technology

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Jones, George Thomas (1902–1929)

Colin G. Clark

Born at Tunstall, Staffordshire, Jones entered Emmanuel College, Cambridge in 1921, took a First in Natural Sciences after two years and then, after an additional two years, a First in Economics. He continued at Christ's as a graduate student for a year, and won both the Adam Smith Prize and a two-year Rockefeller Fellowship, to Harvard in the first year and then in the second year to several other universities, including Stanford, where his thesis was written. He was awarded a PhD from Cambridge in the autumn of 1928 but soon afterwards was killed in a motorcar accident in Rouen.

Jones's career was bound up with that of Allyn Young. In the early 1920s, while Irving Fisher and Taussig were still prominent, Allyn Young at Harvard was becoming one of the best-known American economists. He was called upon to give economic advice to President Harding. There is an interesting legend to the effect that Harding did not like the advice he received, going on to say that he thought that the questions raised were not economic but statistical, and that he would send for the President of the American Statistical Association. 'Why do you want to send for me – I am here', growled Young.

In the 1920s the professorship at the London School of Economics, held by Edwin Cannan, fell vacant. Lionel Robbins was considered a leading candidate but too young (he was born in 1898), so a temporary seat holder was required. Allyn Young agreed to accept the position, but died from pneumonia in London in February 1929. Soon afterwards a new chair was created for Robbins and in fact Young's post was never filled (Robbins 1971, p. 122). For the last few months of his life I was Young's part-time research assistant – not that we got much work done.

Young's principal interest at this time was in what we now call 'economies of scale', but were then called 'increasing returns', on which Young published a seminal paper (1928). In those days people thought that 'increasing returns', if they could be obtained at all, lay in vast self-contained organizations like Ford Motors, which won the admiration of the world in the 1920s. But Young pointed out that what mattered was increasing sub-division and specialization of the processes, and that average size of plant might actually fall. Young certainly startled British opinion when he states that if the population were doubled, British productivity would rise to the American level.

In contrast to Ford's attempt at self-sufficiency within one organization, its rival General Motors followed the opposite policy, contracting out the provision of components to specialized firms. This proved more successful than Ford's policy. (It is interesting to note that planners Soviet Russia have preferred the Ford model.)

At Harvard, Young had gathered around him some able research students, of whom G.T. Jones was outstanding. His early death left a large quantity of unedited text and tables, and Cambridge University Press gave me the job of reducing his tables and statistical writing to a publishable form – I cannot claim to have done it well. The theoretical part of his writing was referred to D.H. (subsequently Sir Dennis) Robertson, who replied that the question of 'increasing returns' was 'a foully difficult subject', on which however he thought there was some more important recent

work. The book was eventually published by Cambridge University Press under the title *Increasing Return*.

Jones devised an ingenious method of comparing an index of the price of output of an industry with a weighted index of prices of its inputs. There was much difficulty, with the wholly inadequate statistical information of those days, in obtaining the necessary weights. The 'price' of capital he put at the current rate of interest; and obtained prices for labour and materials.

The industries covered by Jones were the cotton industry in Lancashire and in Massachusetts; iron production in Cleveland, one of the minor British iron producing districts; and the London building trade.

Jones found no evidence of increasing returns in Cleveland iron, and practically none in Lancashire cotton, but some in the growing Massachusetts industry. The London building trade showed almost constant returns to scale over the whole period from 1840 to 1910, with one exception, namely the introduction of machinery in joinery workshops in the 1870s.

Cotton had been Britain's principal export industry up to the time of World War I. Its apparent inability to attain any economies of scale was a matter of cardinal importance, which contemporaries apparently failed to notice.

G.T. Jones left a posthumous son whose initials were also G.T., apparently with inherited skill – he is a highly capable economist in the Agricultural Economics Institute at Oxford.

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Jones, Richard (1790–1855)

C. A. Gregory

Keywords

English Historical School; Inductive method; Jones, R.; Malthus's theory of population; McCulloch, J. R.; Peasant economy; Ricardian theory of rent

JEL Classifications

B31

Jones was born at Tunbridge Wells, Kent. After finishing his studies at Cambridge in 1816 he took holy orders and served as a curate at various places in England for the next decade and a half. During this time he developed an interest in political economy which culminated in his *Essay on the Distribution of Wealth: Vol. I. Rent* (1831a). Soon after publication he was appointed Professor of Political Economy at the newly established King's College, London. In 1835, following the death of Malthus, he was appointed Professor in the East India College at Haileybury and remained there until his death in 1855. He took an active part in the commutation of tithes and served as a commissioner of tithes from 1836 to 1851.

Jones never wrote the proposed second volume of his book and published very little else during his lifetime. The lectures he gave at King's College and East India College, together with other sundry essays and notes, were published soon after his death as *Literary Remains* (edited by W. Whewell 1859). A persistent theme in Jones's work is a critique of the ahistorical, deductivist methods of the Ricardian school of political economy. He argued for a method he called 'inductivist' and was primarily concerned to overturn the Ricardian theory of rent with an historically based theory that distinguished between farmers' rents and various categories of peasant

rents. He also developed a number of theoretical propositions concerning population and technology that contradicted the Malthusian orthodoxy.

Jones's iconoclastic theories were not well received by his contemporaries. McCulloch, in an extended review in the *Edinburgh Review* (1831), dismissed Jones's book as 'superficial', 'lacking in originality' and 'signally abortive' in its attempt to overthrow the Ricardian theory of rent. This opinion was generally held in the 19th century. However, Jones has acquired something of a reputation in the 20th century. Marx's favourable review of Jones in *Theories of Surplus Value* (1905–10, ch. 24) has been a major contributing factor in this rehabilitation. Marx argued that Jones's theories were a substantial advance on Ricardo because, among other things, Jones had a sense of the historical differences in modes of production and was thus able to conceptualize rent as a form of surplus labour. Jones's theory of peasant rents has also attracted much attention. When his book was reprinted for the first time in 1914, for example, only the first half of his book on peasant rents was republished (see Jones 1831b). Historians of the role of British economic thought in India have shown that his theory of peasant rent had an important impact on policy debates in India in the latter part of the 19th century (Ambirajan 1978, p. 175) and have assessed his theoretical contribution vis-à-vis the Ricardian school very favourably (Barber 1975, ch. 12). Jones's approach to understanding the unfamiliar circumstances of rural India continues to have its advocates even today (Hill 1982, pp. 14–15).

Miller, in two reviews of Jones's contribution to the history of economic thought, has attempted to assess the reputation to which Jones's orginality entitles him as distinct from the reputation that he has acquired. He finds that 'Jones did not really have a distinct inductive approach to offer' (1971, p. 206) and that his theory of rent 'largely deserved McCulloch's harsh judgement that it lacked originality' (1977, p. 360).

Originality is a difficult quality to assess because the theoretical perspective of the observer obviously affects any judgement made. Nevertheless it is clear that Jones's rehabilitation owes more to his advocacy of a method than to his theories. But this method is not 'inductivist'. Jones, as Miller (1971) correctly points out, employs both inductive and deductive reasoning. This is not evidence of a contradiction in Jones's thought, as Miller would argue. Jones's use of the term 'inductivist' is a simple misnomer. What is distinctive about Jones's method is the comparative and historical perspective he adopts. This method is now the basis of many non-neoclassical approaches to the economy. Not only does Jones deserve to be regarded as the founder of the English Historical School (Edgeworth 1899), he also deserves to be regarded as the founder of the English Comparative Economy School because of his contribution to the theory of peasant economy.

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Joplin, Thomas (C. 1790–1847)

D. P. O'Brien

Keywords

Bank of England; Banking School; Currency School; Dual-circulation hypothesis; Joplin, T.; Metallic circulation theory; Monetary economics, history of

JEL Classifications

B31

Joplin was born, probably in Newcastle upon Tyne, England, about 1790, and died in Silesia in 1847. He is important both as a banking pioneer and as a monetary theorist.

Joplin's interest in both banking and money was spurred by the banking failures in Newcastle after 1815. The failure of these partnership banks led Joplin, inspired by the joint stock banks over the border in Scotland, into a campaign for the countrywide establishment of such banks in England, and for the loosening of the Bank of England's monopolistic grip upon this form of banking. Working with enormous energy, and brooking no opposition, he established two major joint stock banks; the Provincial Bank of Ireland and the National Provincial Bank of England. But the financial establishment in London, who would have found Joplin's Newcastle accent impenetrable and his rough manners repellent, froze him out, and he received little financial recompense for his achievements, despite the fact that he laid the foundations of the modern British banking system.

His most striking achievements, from an intellectual point of view, lay in the field of monetary economics. Not only did he comment actively and perceptively on monetary policy – and he has a clear claim to be the single most important influence in the development of the lender-of-last-resort doctrine (O'Brien 2003) – but he developed a macroeconomic model of quite extraordinary sophistication (O'Brien 1993). This involved a treatment of the circular flow of income, an income multiplier, a model of the transmission of monetary changes, an analysis of aggregate supply, and an explanation for depression and unemployment. In the course of all this he employed a dual-circulation hypothesis; and this led to an analysis of the operation of the monetary system which was fundamentally subversive of 19th-century monetary orthodoxies.

On the one hand, Joplin was quite clear – unlike the members of the Banking School – that causality ran from monetary disturbance, and the balance of payments, to the level of money income. On the other, he was equally clear, unlike the Currency School, that controlling the note issue of the Bank of England was not the key to price and balance of payments stability.

The Bank of England circulation, he argued, supplied the financial circulation of the country, but this had only a very limited effect on prices. The price level was largely determined by the circulation of the country banks; but, because they held their lending rate rigid and varied the note issue with demand, they failed to vary the note issue in conformity with inflows and outflows of gold resulting from variations in the overall balance of payments on current (the main concern) and capital account.

Yet not only would such a response by the country banks be prudent, given that the note issue was convertible into gold, but it was required if variations in the note issue were to be corrective of external disequilibrium. Joplin was one of the earliest to put forward the theory of 'metallic circulation' – the idea that a mixed currency of gold coins and notes should vary in amount exactly as an identically circumstanced fully metallic currency would, in an open economy. Such fluctuation was designed not only to correct the balance of payments, through monetary contraction lowering the level of money income when gold was flowing out, and vice versa, but to act counter-cyclically, thus limiting economic fluctuations (O'Brien 1995).

Joplin argued that the behaviour of the country banks ensured that metallic fluctuation was not

achieved. The solution lay in the introduction of a currency system tied closely to gold which would prevent the perverse behaviour of the country banks.

Joplin's view of the operation of the monetary system involved hypotheses about the relationships between basic macroeconomic building blocks, which differed fundamentally from those of the ruling orthodoxies. But methodologically Joplin was far ahead of his time, writing explicitly about the need to formulate hypotheses and test them. The contrast with the apriorism of Ricardo could hardly be greater. Application of modern econometric techniques to the data collected by Joplin, supplemented by other data, not all of which were available in his lifetime, provides remarkable support for his view of the operation of the monetary system (O'Brien 1993, ch.13; 1997). In particular, it seems clear that changes in the issues of country bank notes affected the price level, while those of the Bank of England, supposedly at the heart of the money supply, did not; that bullion flows across the exchanges did not respond to variations in the Bank of England note issue but were influenced by the country bank issues; that changes in the country bank note issues were the main source of monetary instability; and that the Bank of England note issue did not act as the high-powered money base of the system.

Joplin was an important economist, one who also offered important insights into the theory of international trade. But he was treated as an outsider, in both banking and intellectual circles. Neither the Banking School nor the Currency School seems to have deigned to take any public notice of him. Inevitably with Joplin, he did not make any attempt to ingratiate himself with others, and was free with accusations of plagiarism, directed not merely at Francis Horner (Joplin suggested the creation of a word 'hornering' to describe such activity) but even at Ricardo. Yet all this was extremely unfortunate; there seems little doubt that, had Joplin had more influence, and his ideas been considered more seriously, the catastrophic liquidity crises of 1847 and 1857 in Britain would have been avoided.

See Also

- ▶ Bank of England
- ▶ Banking Industry
- ▶ Gold Standard
- ▶ Monetary Economics, History of
- ▶ Overstone, Lord [Samuel Jones Loyd] (1796–1883)

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Jordan, Economy of

Barry Turner

Keywords
Amman Financial Market; Fils; Jordan dinar; Water

JEL Classifications
O53; R11

Overview

Jordan is classified by the World Bank as an upper-middle-income country. However, it has few natural resources (aside from potash and phosphate) and suffers from a shortage of water, fertile land and oil.

Around 80% of the population live in cities, while the population is one of the youngest among middle-income countries, with 38% aged under 14. Services account for over three-quarters of jobs and 70% of GDP. Jordan has one of the most open economies in the Middle East and is well integrated with its neighbors. Remittances from abroad are also important.

Between 2000 and 2009 the economy grew on average by 7.1% per year, led by a favorable external environment and the expansion of the manufacturing and construction sectors. However, growth fell to 2.5% in 2011, while inflation reached 5% in 2010. Services accounted for 65.5% of GDP in 2009, industry 31.6% and agriculture 2.9%.

Since the early 2000s, the government has focused on liberalization and privatization. There have been structural reforms to the health, education and tax systems. Declining gas supplies from Egypt in 2012 forced Jordan toward more expensive alternatives, worsening the fiscal position. In addition, the conflict in Syria since 2011 has resulted in a mass influx of refugees, putting pressure on public institutions and social services.

Long-term development has suffered as funds planned for capital expenditures have been diverted to meet immediate operating costs. In 2012 an IMF stand-by arrangement worth US$2 bn. was granted to stabilize the financial markets. Nevertheless, Jordan is highly vulnerable to fluctuations in world oil and food prices. Further reforms are needed to address the country's high unemployment, dependency on remittances, lack of natural resources and the knock-on effects of regional instabilities.

Currency

The unit of currency is the *Jordan dinar* (JOD), usually written as JD, of 1,000 *fils*, pegged to the US dollar since 1995 at a rate of one dinar = US$1.41. There was deflation of 0.7% in 2009 but inflation of 5.0% in 2010 and 4.4% in 2011. Foreign exchange controls were abolished in July 1997. Foreign exchange reserves were US $5,601 m. and gold reserves 411,000 troy oz in July 2005. Total money supply in May 2005 was JD 3,487 m.

Budget

In 2007 revenues totalled JD 3,971.5 m. and expenditures JD 4,540.1 m. Tax revenue constituted 75.4% of revenues in 2007; social protection accounted for 28.0% of expenditures, defence 16.7% and education 13.9%.

There is a sales tax of 16% (reduced rates, 4% and 0%).

This is an edited and updated version of the economic profile of this country that appears on The Statesman's Yearbook Online: http://www.statesmansyearbook.com/

Performance

Total GDP was US$31.0 bn. in 2012. Real GDP growth was 2.3% in 2010 and 2.6% in 2011.

Banking and Finance

The Central Bank of Jordan was established in 1964 (*Governor*, Ziad Fariz). In 2002 there were nine national banks, seven foreign banks and 11 specialized credit institutions. Assets and liabilities of the banking system (including the Central Bank, commercial banks, the Housing Bank and investment banks) totalled JD 8,430.4 m. in 1995.

Foreign debt was US$7,822 m. in 2010, representing 27.9% of GNI.

There is a stock exchange in Amman (Amman Financial Market).

See Also

- ▶ Energy Economics
- ▶ International Monetary Fund
- ▶ Islamic Economic Institutions
- ▶ Islamic Finance
- ▶ Oil and the Macroeconomy
- ▶ Organization of the Petroleum Exporting Countries (OPEC)

Juglar, Clément (1819–1905)

Murray Milgate

Keywords

Business cycles; Circular flow; Juglar cycles; Juglar, C.; Mitchell, W. C.; Real business cycles; Schumpeter, J. A.; Wicksell, J. G. K.

JEL Classifications

B31

Like his rather more illustrious compatriot Francois Quesnay, Juglar is an example of a physician turned economist. The circular flow of economic life – which it is often said Quesnay saw in terms of an analogy to the circulatory system – in Juglar's work seems have as its counterpart the view of the economic process as one of quasi- rhythmical variations between good and bad trade. This simple idea has been of profound importance in the study of alterations in the conditions of economic prosperity ever since. Both Wesley Clair Mitchell and Joseph Schumpeter in their classic studies of business cycles (in 1927 and 1939 respectively) credit Juglar's contribution as having been seminal in the field. For Mitchell, it was Juglar's recognition of the *cyclical* character of economic crises that established him as a pioneer (1927, p. 452); for Schumpeter it was Juglar's perception of how theory, statistics and history ought to contribute to the study of industrial fluctuations (1939, pp. 162–3). There is something to each of these claims, but it should not be forgotten that other authors had also done much in both of these areas – one may mention Samuel Jones Loyd, John Wade and Amasa Walker. As theorists of industrial fluctuations, of course, Sismondi, Rodbertus and Marx would also need to be mentioned.

Juglar practised as a physician until 1848. His first work in the social sciences was on the cyclical pattern of birth, death, and marriage rates in France, and it appeared in the *Journal des Economistes* in October–December 1851 and January–June 1852. He moved on to examine the discount policy of the Bank of France and published his findings in the *Annuaire de léconomie politique* for 1856 and in the *Journal des Economistes* for April–May 1857. In 1852 he was elected into the Société d'Economie Politique and he was one of the founders of the Société de Statistique de Paris in 1860. In 1868 he published an account of the policies and practices of the French monetary authorities and their effects on the exchanges.

There is, however, little doubt that Juglar's most important work on business cycles is his *Des crises commerciales et de leur retour périodique en France, en Angleterre, et aux Etats-Unis*, first published in 1860. Juglar's analysis of crises is essentially a monetary one – protracted

periods of inflation and expansion are brought to an end when the banking system initiates a contraction in the face of unacceptable pressures on its specie reserves. This is very like the story Wicksell was later to tell, but without the sophistication of Wicksellian theory. Subsequent theories of the business cycle, which attributed the process to 'real' causes, were critical of this aspect of Juglar's argument. The observed periodicity of the cycle – of nine to ten years – is commonly known in the applied literature on business cycles as a Juglar cycle.

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Jurisprudence

P. G. Stein

Jurisprudence is the general theory of law: the study of what law is, what it is for, and how it comes into being. Until the 18th century there were essentially two approaches to this study. One regarded law as the expression of political power; the other considered it to be the expression of justice.

The first line of thought, today loosely known as positivism, holds that a rule is law because it has been laid down (*positum*) by whatever body has authority in the community. Already in Plato's *Republic,* Thrasymachus argued that 'just' and 'right' are merely names given by the power-holders in the state to the types of conduct they wish to impose on their subjects. With the rise of nation states in the 16th century, the theory was expressed in more sophisticated form. Sovereignty meant freedom from any kind of external limitation. Thus when the sovereign legislated, his will could not be subjected to any restriction. Even custom only became law when it had been confirmed by the sovereign's will. Thomas Hobbes developed the notion in *Leviathan* (1651), as part of his explanation of how civil society grew out of the state of nature. In his view, that condition was a war of all against all, in which each man sought only his own personal advantage. Men could enjoy the benefits of civilization only by submitting themselves to a ruler who would give them the security that they needed. Once established as sovereign, the ruler was subject to no control by his subjects, so long as he was able to offer them personal protection. Law was therefore nothing more than the commands of the sovereign.

The alternative line of thought holds that no rule can be considered to be law without regard to its moral content. Laws must be just and what is just in any given situation can be discovered from the nature of man as a rational and social animal. Whatever their cultural differences, all men are so constituted by nature (in the Stoic view set out, for example, by Cicero in *De legibus*) or by God (in the Christian view put forward, for example, by St Thomas Aquinas), that they share a common sense, or natural reason. It is this which tells them what is just and what is unjust. Until the 17th century those who adopted this approach, the natural lawyers, did not suggest that all laws were or could be natural. They accepted that many laws were merely positive, based on considerations of utility, but argued that natural law provided a criterion and that no rule could be law which actually contradicted it.

From the 17th century onwards there have been two versions of natural law theory. One is concerned to safeguard the position of the individual in the community. It exploited the ambiguity of the word for law in Latin and most European

languages other than English (e.g., *ius, droit, Recht*), which means both the (objective) law in general and a (subjective) right enjoyed by an individual. Natural law came to be seen as concerned with the natural rights, particularly those of life, liberty and property, which belong to individual men in a state of nature. For John Locke, when men join together in civil society under a ruler, they cannot transfer to him more power than they have themselves. Since no one has absolute arbitrary power over himself, the ruler cannot receive from his subjects power to interfere with their natural rights, and any legislation which purports to do so is void. This natural rights theory provided the basis for the English settlement of 1688, which subordinated the Crown and its servants to the law, and a century later for the American Constitution under which any legislation which infringes the natural rights enshrined in it is void. Recently Ronald Dworkin (1978) has given new life to this line of thought.

The other version of natural law theory was largely motivated by the desire to present law as a science organized according to rational principles. Its principal exponents, Grotius and Pufendorf, held that the content of law must be justified in terms of principles which are as axiomatic as those of geometry and which have absolute validity in all times and places. Their 18th-century successors went further and argued that once these principles are established, complete systems of universal legal rules can be deduced from them by logic.

Although the obligatory character of natural law was derived from the divine will, discussion of its institutions was in terms of rational analysis of the needs of man in social life and they were generally justified by an often rather vague notion of maximizing the welfare of society. The removal of God from most accounts of natural law in the 18th century meant that its obligatory character had now to be provided by human will and its content justified by a secular utilitarianism. Several blueprints of 'natural' systems were offered to the enlightened rulers of the day to be enacted by them into law, foreshadowing the codification movement of the 19th century.

Jeremy Bentham and his disciple John Austin (*The province of jurisprudence determined,* 1832) insisted on a sharp distinction between the validity of law and its content. Building on Hobbes's notion, they held that laws are the commands of the sovereign, for whom utilitarianism provides a guide, and jurisprudence is merely their systematic exposition. In Austin's analysis, 'law properly so-called' requires an independent political society, the bulk of whose members must be in the habit of obedience to a person or body, not itself habitually obedient to any other person or body. Only the commands of such a 'sovereign' are law. The model was Parliamentary legislation and Benthamite–Austinian ideas had great influence on the spate of legislation enacted by Parliament after the Reform Act of 1832. However, the notion is not readily applicable either to the English common law, which was largely judge-made, although its rules could always be altered by Parliament, or to statutory rules enacted in a federal state where the powers of the different legislatures are limited by a constitution.

The positivist position has been forcibly re-stated in contemporary terms by H.L.A. Hart (1961), who concentrated on the obligatory character of the rules that make up the legal system. He developed the distinction between primary rules, which govern behaviour, and secondary rules, which specify the ways in which the primary rules can be identified ('the rules of recognition') or altered or applied through adjudication. But Hart is reluctant to accept the position that laws may have any content at all and argues for a minimum form of protection for persons, property and promises, in any legal system.

The mid-18th century saw the beginnings of a third approach to jurisprudence. Montesquieu, in *De l'Esprit des lois* (1748) started from the apparently orthodox natural law position that law in general is human reason and that the laws of each nation should be the particular applications of that reason. He then demonstrated, however, that the laws most conformable to nature were those best adapted to the particular circumstances of each society. For the nature of things varies from one society to another and so laws must vary with the climate, soil, principal occupation

of the people, their religion, manners and so on. Such factors together make up the spirit of a society to which the laws must conform. A few years later, in his *Lectures on Jurisprudence,* Adam Smith combined these ideas with that of the progress of societies from barbarism to civilization. Like the positivists, he was concerned to distinguish what a man can be compelled to do from what he ought morally to do, but argued that this changes as societies move from the hunting stage to the stages of shepherds, farmers and merchants. Like Grotius and Pufendorf, he thought of private law as primarily concerned with property and contract and showed that the relevant rules change according to what the 'impartial spectator' in a society considers to be property or according to what are his expectations on receiving a promise from another.

In the 19th century the German historical school, led by F.K. von Savigny, opposed the movement for codification of law with the romantic idea that a people's law, like its language, is inextricably linked to its traditional culture, so that it evolves not through the external will of a legislator but through 'internal silently operating forces'. In England, Sir Henry Maine (*Ancient Law,* 1861) adapted this notion to combat Benthamism, arguing that in 'progressive societies' law develops through recognized stages without the need for legislation. For example, he demonstrated the gradual substitution of the individual for the family as the unit with which the law is concerned, leading to the ordering of a person's social relations through free agreement rather than by his family position ('the movement from Status to Contract').

Although many of its propositions were incompatible with the findings of anthropology and legal history and were unacceptable to those concerned with reforming the law, historical jurisprudence did concentrate attention on the way law actually operates in society. Studies in the sociology of law have shown that it is misleading to see law as just a system of rules. People actually govern their behaviour by a variety of norms, such as custom or professional practice, and formal law is only one component. Jurisprudence should therefore be concerned with the interaction of the formal law with these other forms of social order.

This approach was developed, particularly in the USA, by the so-called legal realists. They focused attention on court decisions, and argued that law is nothing more than the prediction of what judges and officials concerned with the administration of the law will do in fact. They showed that although judges often rationalize their decisions in syllogistic form to emphasize legal certainty, they are in fact influenced by many factors other than existing rules. Policy preferences and unconscious social prejudices all affect decisions and must therefore form part of the subject matter of jurisprudence.

By contrast, the economic analysis of law is part of a larger movement to apply the economic model to an ever wider range of human behaviour and social institutions. Its main exponents, for example R.A. Posner (1977), argue that, when the legal regulation of non-market conduct in England and America is seen in economic terms, common law judges appear to have made their decisions in hard cases in such a way as to promote efficient resource allocation. It is not clear whether such findings are merely descriptive or also normative.

In recent years jurisprudence has been increasingly concerned with the process of legal reasoning, and with the question whether there is a particular legal logic. It is acknowledged that apart from legal rules, decisions are affected by certain fundamental notions, which must therefore be regarded as part of the system. Whereas traditionally jurisprudence was concerned mainly with private transactions between one citizen and another, it is today concerned more with the regulation of public power over the individual. There is a tension between those who see law as embodying certain values, such as individual liberty, procedural justice etc., which control the application of the rules, and those who see it instrumentally, as concerned only with the techniques of achieving certain goals settled by policies with the content of which the law itself is not concerned.

The latest current in American jurisprudence is the radical movement known as Critical Legal Studies, founded at a conference in Wisconsin in 1977. Its adherents reject the notion that legal

practices derive from identifiable doctrines or principles and deny the existence of any specifically legal form of reasoning. Influenced by sociologists of knowledge, they argue that legal thought has claimed to be objective, when it is really dominated by ideologies and (oppressive) social orders. They reject the findings of the Economics of Law school and argue that plausible justifications can be found for any decisions which are desired on policy grounds.

See Also

- ▶ Common Law
- ▶ Constitutional Economics
- ▶ Law and Economics
- ▶ Natural Law

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Just Price

Odd Langholm

Keywords

Albert the Great; Alexander of Hales; Aquinas, St. T.; Aristotle; Duns Scotus, J.; Just price; Market price; Odonis, G.; Olivi, P.

JEL Classifications

B0

The idea of the just price is associated primarily with scholastic economics. The schoolmen suggested two ways of estimating the just price, with reference to cost and with reference to the market. The former originated in reply to some of the Church fathers, who claimed that merchants reaped an unjust profit from the toils of others. Alexander of Hales (d. 1240), Peter Olivi (d. 1298), John Duns Scotus (d. 1308) and other schoolmen together compiled a catalogue of cost elements incurred in trade: transport, storage, risk, costly training, professional expertise and diligence, as well as support of the merchant and his family. The cost estimate was confirmed by the schoolmen's interpretation of the strange formula of exchange appearing in Aristotle's *Nicomachean Ethics*. In Book V, on justice, Aristotle presents a cast of characters – a builder, a shoemaker, a farmer, a doctor. 'As a builder is to a shoemaker, such and such a number of shoes must be to a house' (1973, 5: ll33a22–3; author's translation). What could this mean? Albert the Great (d. 1280), the first Latin commentator, and numerous followers, suggested that it might mean equality in proportion to the labour and expenses incurred in the production of the goods offered in exchange. Albert did not merely indicate that economic exchangers deserve cost coverage but that society requires it. If a carpenter (another of Aristotle's characters) is not paid for a bed as much as it costs him to make it, he will stop making beds – a medieval hint about the law of cost. Scotus says much the same about merchants in general. If no one will be a merchant, the authorities must appoint functionaries and pay them accordingly.

The exchange formula in the *Ethics* also gave rise to the market estimate of the just price. According to Aristotle, human need is the cause of exchange. Thomas Aquinas (d. 1274) suggested, and many others agreed, that need is not only the cause of exchange; it is a measure of the value of goods in exchange as well. This could not apply to individual need, as John Buridan (d. c. 1360) points out. It would follow that a poor man should pay more for a measure of corn than a rich man because his need is greater. It must apply to common need. In the words of Henry of Friemar (d. 1340), the need that measures goods in exchange ought not to be

taken partially with regard to this or that person, but universally with regard to the whole community. This value estimate was challenged and confirmed with reference to Roman law. Some early manuscripts of the *Digest* (a compendium of Roman law compiled in the 6th century AD) contain a gloss stating that a thing is worth the amount at which it can be sold. Seemingly granting unconditional economic power to those in possession of scarce goods needed by others, this maxim was modified by the principle of commonality precisely in line with the Aristotelian formula. In a gloss to the *Digest,* the Romanist Azo (d. c. 1220) states that a thing is worth the amount at which it commonly can be sold. The canonist Laurence of Spain (d. 1248) confirmed this interpretation, which earned universal acceptance among the schoolmen. A common estimate, based on common need, can mean several things. The schoolmen tended to associate it with the market or, more precisely, with the common, competitive market price. Albert the Great explicitly defined the just price as 'that price at which the good can be valued according to the estimation of the market at the time of the contract' (1894, 16: 46, p. 638; author's translation).

The schoolmen envisaged no conflict between the cost and market estimates of the just price. That conflict is of a much more recent date. The two estimates were used interchangeably and are perhaps best understood as complementary and mutually supportive criteria when the market did not function properly. When it did, cost had to adapt to the market anyhow. Does the fact that these estimates were thus associated mean that the medieval schoolmen anticipated modern value theory? Certainly not, but there are suggestions worth noting in some of the *Ethics* commentaries, where the two principles are textually close. Note may be made of Gerald Odonis (d. 1349), an exceptionally perceptive and original thinker, who applied both principles to the payment of professional services rather than commodities. This is a marginal case, but it points to an important generalization. A price obtained when the market did not function properly owing to monopoly or other market irregularities was held to be unjust because it involved economic coercion. Free consent to the price on the part of both the seller and the buyer was a fundamental requirement of justice in exchange.

See Also

- ▶ Albert the Great, Saint Albertus Magnus (c.1200–1280)
- ▶ Aquinas, St Thomas (1225–1274)
- ▶ Scholastic Economics

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Justi, Johannn Heinrich Gottlob Von (1720–1771)

K. Tribe

Keywords

Justi, J. von; Cameralism

JEL Classifications

B31

Born in modest circumstances in a Thuringian village in late December 1717, Justi is best known today as one of the architects of mid-18th-century cameralism. He studied law at Wittenberg in 1742–4, then embarked upon a career of literary activity and state service. In 1750 he was appointed tutor to the son of Haugwitz, reforming administrator of Maria Theresa, archduchess of Austria, and then later the same year to a post at the Viennese Theresianum, where he lectured on 'commerce and public economics' to civil servants of noble descent. The lectures were later published in 1755 under the title Staatswirthschaft, by which time Justi had made a hasty departure from Vienna and taken up a new post as Director of Police in Göttingen. This was associated with a transfer of political allegiance from Vienna to Berlin, which new allegiance forced him to leave Göttingen in 1757 when occupation by the French, allied with the Austrians, threatened. For several years he lived from his writings, before being appointed Prussian Inspector of Mines, Glass and Steel Works in 1765. Embroiled in a financial scandal of obscure origin in 1768, he was imprisoned and died in the fortress at Küstrin in 1771.

Justi's literary output and journalistic activity was extensive, if repetitive, ranging over aesthetics, philosophy, history, politics and economics. His major work is the *Staatswirthschaft* (1755, 1758), literally 'state economy', which details the manner in which a ruler should govern his lands to assure the 'happiness of the state' and a flourishing population. Cameralism had begun as a systematization of the principles followed by the administrators of the ruler's domains. In Justi these principles are identified with the management of the absolutist state, in which economic welfare is conceived identified as the path to political power. Welfare and wealth are produced by good government and the implementation of 'good police' – *Polizei* in the 18th-century sense of regulations covering all aspects of social action and public order. The 'science of police' is covered in a further textbook, *Grundsätze der Policey-Wissenschaft* (1756, 1759, 1782), which Justi claimed to be the first systematic treatment of the subject, and which was in fact republished after his death in a revised edition. Justi's influence was strong during the later 18th century, diminishing only with the general decline of cameralism at the turn of the 19th century.

See Also

- ▶ Cameralism
- ▶ German Economics in the Early 19th Century
- ▶ Sonnenfels, Joseph von (1733–1817)

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Justice

Amartya Sen

Abstract

Traditionally, economists have treated justice as a component of social welfare maximization. Recently, philosophical treatments of justice have challenged the three principles underlying utilitarianism: welfarism, sum-ranking and consequentialism. Various theories of justice advance alternatives to utility (such as Rawls's notion of 'primary goods') as a basis for social judgements, counterpose distributional criteria (such as Sen's 'leximin' rule) to the aggregative approach of utilitarianism, and assert the moral priority of certain aspects of individual advantage (such as Nozick's idea of individual rights as entitlements) over consequences. This article attempts to distinguish and clarify these conceptions of justice.

Keywords

Arrow, K.; Consequentialism; Difference principle; Entitlements; Envy; Equality; Fairness; Interpersonal utility comparisons; Justice; Leximin; Liberty; Maximin; Meade, J.; Nozick, R.; Pigou, A.; Primary goods; Property rights; Rawls, J.; Sen, A.; Sum-ranking; Utilitarianism; Welfarism

JEL Classifications

K0

Justice and Utilitarianism

The concept of justice is often invoked in economic discussions. Its relevance to economic evaluation is obvious enough. However, it is fair to say that in traditional welfare economics, when the notion of justice has been invoked, it has typically been seen only as a part of a bigger exercise, viz., that of social welfare maximization, rather than taking justice as an idea that commands attention on its own. For example, in utilitarian welfare economics (e.g. Pigou 1952; Harsanyi 1955) the problem of justice is not separated out from that of maximization of aggregate utility. This situation has been changing in recent years, partly as a result of developments in moral philosophy dealing explicitly with the notion of justice as a concept of independent importance (see especially Rawls 1971, 1980).

In the utilitarian formulation the maximand in all choice exercises is taken to be the sum-total of individual utilities. The approach can be seen as an amalgam of three distinct principles: (1) welfarism, (2) sum-ranking, and (3) consequentialism. *Welfarism* asserts that the goodness of a state of affairs is to be judged entirely by the utility information related to that state, i.e., by information about individual utilities. All other information is either irrelevant, or only indirectly relevant as a causal influence on utilities (or as a surrogate for utility measures when such measurement cannot be directly done). The second principle is *sum-ranking,* which asserts that the goodness of a collection of utilities (or welfare indicators) of different individuals, taken together, is simply the sum of these utilities (or indicators). This eliminates the possibility of being concerned with inequalities in the distribution of utilities, and the overall goodness or 'social welfare' is seen simply as the aggregate of individual utilities. The third principle is *consequentialism,* which requires that all choice variables, such as actions, rules, institutions, etc., must be judged in terms of the goodness of their respective consequences. The overall effect of combining these three principles is to judge all choice variables by the sum-total of utilities generated by one alternative rather than another.

Sum-Ranking and Equality

A theory of justice can take issue with each of the principles underlying utilitarianism, and in fact in the literature that has developed in recent decades, each of these principles has been seriously challenged (see the papers included in Sen and Williams 1982). Some critiques have been particularly concerned with assessing and questioning the axiom of sum-ranking, and have considered the claims of equality in the distribution of well-being (see, for example, Phelps 1973; Sen 1973, 1977, 1982; Kern 1978).

The summation formula can be defended either directly (e.g., in terms of attaching equal importance to everyone's 'interest': see Hare 1981, 1982), or indirectly through invoking some model of 'impersonality' or 'fairness' (e.g., involving a hypothetical choice in a situation of primordial uncertainty, in which each person has to assume that he or she has an as if equal probability of becoming anybody else: see Vickrey 1945; Harsanyi 1955). Other routes to deriving sum-ranking involve independence or separability requirements of various kinds (see d'Aspremont and Gevers 1977; Deschamps and Gevers 1978; Maskin 1978; Gevers 1979; Roberts 1980; Myerson 1981; Blackorby et al. 1984; d'Aspremont 1985).

Whether the defences obtainable from these approaches are convincing enough has been a

matter of some dispute. There have also been some interpretative discussions as to whether giving equal importance to everyone's 'interest' does, as alleged, in fact yield the formula of summing individual utilities *irrespective* of distribution, and also whether the additive formula that is obtained on the basis of hypothetical primordial choice is, in fact, a justification for adding individual utilities as they might be *substantively* interpreted in welfare economic exercises (see Pattanaik 1971; Smart and Williams 1973; Sen 1982, 1985a; Blackorby et al. 1984; Williams 1985). It is not obvious that this debate has been in any way definitively concluded one way or the other.

The Difference Principle and Leximin

Meanwhile, much attention has been paid to developing welfare-economic rules based on taking explicit note of inequalities in the distribution of utilities. A definitive departure on this came from Suppes (1966). Another major approach was developed in Rawls's (1971) *Theory of Justice,* even though Rawls himself was concerned not so much with the distribution of *utilities* but with that of the indices of primary goods (on which more later). The concern with the utility level of the worst-off individual has been formalized and reflected in various formulae suggested or derived in the rapidly growing welfare-economic literature on this theme. In particular, James Meade (1976) has provided an extensive treatment of this type of distributional issues, and it has also been penetratingly analysed by Kolm (1969), Phelps (1973, 1977), Atkinson (1975, 1983), Blackorby and Donaldson (1977), and others.

In fact, the Rawlsian 'Difference Principle', which judges states of affairs by the advantage of the least well-off person or group, has often been axiomatized in welfare economics and in the social-choice literature by equating advantage with utility. In this form, the 'lexicographic maximin' rule (proposed in Sen 1970) has been axiomatically derived in different ways. The rule judges states of affairs by the well-being of the worst-off individual. In case of ties of the worst-off individuals' utilities, the states are ranked according to the utility levels of the second worst-off individuals respectively. In case of ties of the second worst-off positions as well, the third worst-off individuals' utilities are examined. And so on.

There is no necessity to interpret these axioms in terms of utilities only,s and in fact the analytical results derived in this part of the social-choice literature can be easily applied without the 'welfarist' structure of identifying individual advantage with the respective utilities. Various axiomatic derivations of lexicographic maximin – 'leximin' for short – can be found in Hammond (1976), Strasnick (1976), Arrow (1977), d'Aspremont and Gevers (1977), Sen (1977), Deschamps and Gevers (1978), Suzumura (1983), Blackorby et al. (1984), d'Aspremont (1985), among others. These can be seen as exercises that incorporate concern for reducing inequality, related to recognizing the claims of justice.

While the Rawlsian approach rejects the aggregation procedure of utilitarianism(i.e., ranking by sums), a major aspect of the Rawlsian theory involves the rejection of utility as the basis of social judgements (i.e., welfarism). Rawls (1971) argues for the priority of the 'principle of liberty', demanding that 'each person is to have an equal right to the most extensive basic liberty compatible with similar liberty for others'. Then, going beyond the principle of liberty, claims of efficiency as well as equity are both supported by Rawls's 'second principle' which *inter alia* incorporates his 'Difference Principle' in which priority is given to furthering the powers of the worst-off group. These powers are judged by indices of 'primary social goods' which each person wants (Rawls 1971, pp. 60–65).

Primary goods are 'things that every rational man is presumed to want', including 'rights, liberties and opportunities, income and wealth, and the social bases of self-respect'. The Difference Principle takes the form, in fact, of maximin, or lexicographic maximin, based on interpersonal comparisons of indices of primary goods. This rule can be axiomatized in much the same way as the other 'lexicographic maximin' rule based on utilities, and all that is needed is a reinterpretation of the content of the axioms (with the objects of value being indices of primary goods rather than utilities).

The Rawlsian approach to justice, therefore, involves rejection both of welfarism and of sum-ranking. Furthermore, consequentialism is disputed too, since the priority of liberty might possibly go against judging all choice variables by consequences only. At least, in the more standard forms, consequentialism does involve such a conflict, even though it is arguable that the problem can be, to a great extent, resolved by a broader understanding of consequences, which takes into account the fulfilment and violation of liberties and rights, and also the agent's special role in the actions performed (Sen 1985a).

Utilities, Primary Goods and Capabilities

The claim of primary goods to represent the demands of justice better than utilities is based on the idea that utilities do not reflect a person's advantage (in terms of well-being or powers) adequately. It is arguable that in making interpersonal comparisons of advantage, the metric of utilities (either in the form of happiness, or of desire fulfilment) may be biased against those who happen to be hopelessly deprived since the demands of unharrassed survival force people to take pleasure in small mercies and to cut their desires to shape in the light of feasibilities (see Sen 1985a, b). The status of 'preference' may be disputed in view of the need for critical assessment (see Broome 1978; McPherson 1982; Goodin 1985, among others). Also, what types of pleasures should 'count' can itself be a matter for an important moral judgement. As Rawls (1971) points out, in the utilitarian formulation, we have the unplausible requirement that

> if men take a certain pleasure in discriminating against one another, in subjecting others to a lesser liberty as a means of enhancing their self-respect, then the satisfaction of these desires must be weighed in our deliberations according to their intensity, or whatever, along with other desires (pp. 30–31).

These and other types of difficulties have been dealt with by some utilitarians through moving to less straight-forward versions of utilitarianism, for example Harsanyi's (1982) exclusion of 'all antisocial preferences, such as sadism, envy, resentment, and malice' (p. 56); see also the refinements proposed by Hare (1981, 1982), Hammond (1982) and Mirrlees (1982).

Recently, it has been argued that primary goods themselves may be rather deceptive in judging people's advantages, since the ability to convert primary goods into useful capabilities may vary from person to person. For example, while the same level of income (included among 'primary goods') may give each person the same command over calories and other nutrients, the nourishment of a person depends also on other parameters such as body size, metabolic rates, sex (and if female, whether pregnant or lactating), climatic conditions, etc. This indicates that a more plausible notion of justice may demand that attention be directly paid to the distribution of basic capabilities of people (see Sen 1982, 1985b). The approach goes back to Smith's (1776) and Marx's (1875) focus on fulfilling needs.

The achievement of capabilities will, of course, be causally related to this command over primary goods, and the capabilities, in their turn, will also influence the extent to which utilities are achieved, so that the various alternative measures will not be independent of each other. However, the basic issue is the variable that should be chosen to serve as the proper metric for judging advantages of people – the equity and the distribution of which could form the foundations of a theory of justice. On this central issue several alternative views continue to flourish in the literature.

Fairness and Envy

A view of justice that is not altogether dissimilar from Rawls's concerned with primary goods is captured by the literature on 'fairness', inspired by a pioneering contribution of Foley (1967). In this approach a person's relative advantage is judged by the criterion as to whether he or she would have preferred to have had the commodity bundle enjoyed by another person. This has been seen as a criterion of 'non-envy'. If no one 'envies' the bundle of anyone else, the state of

affairs is described as being 'equitable'. If a state is both equitable and Pareto efficient, it is described as being 'fair' (even though the term fairness is also sometimes used interchangeably with only 'equitability').

There has been an extensive literature on existence problems, in particular whether equitability can be combined with efficiency in all circumstances. (The answer seems to be no, especially when production is involved: Pazner and Schmeidler 1974.) There has also been considerable exploration of the effects of varying the criterion of equitability and fairness to reflect better the common intuitions regarding the requirements of justice. Various results on these problems and related ones have been presented, among many others, by Foley (1967), Schmeidler and Vind (1972), Feldman and Kirman (1974), Varian (1974, 1975), Svensson (1980), and Suzumura (1983).

It should be remarked that the fairness criterion does not provide a complete ranking of alternative states. It identifies some requirements of justice, which makes the states fair. Varian (1974) has argued, with some force, that 'social decision theory asks for too much out of the process in that it asks for an entire *ordering* of the various social states (allocations in this case)', whereas 'the original question asked only for a "good" allocation; there was no requirement to rank all allocations' (pp. 64–5). While it is true that 'the fairness criterion in fact limits itself to answering the original question', the absence of further rankings may be particularly problematic if no feasible 'fair' allocation exists incorporating efficiency (as seems to be the case in many situations). Furthermore, while a 'pass-fail' criterion of justice may have attractive simplicity, it does not follow that two states, both passing this criterion, must be seen as being 'equally just'. Various 'finer' aspects of justice have indeed been discussed in the literature (see particularly. Suppes 1966; Kolm 1969; Rawls 1971; Meade 1976; Atkinson 1983).

It should also be noted that the 'fairness' literature deals with commodity allocations, or incomes, or some other part of the set of things that figures in Rawls's characterization of 'primary goods'. The list is, in fact, much less extensive than that of primary goods as defined by Rawls (1971), and as such it leaves out many considerations that are regarded as important in the Rawlsian framework (e.g., the social bases of self-respect). On the other hand the criticisms – discussed earlier – of the Rawlsian focus on primary goods (based on recognizing inter-individual variations in the ability to convert primary goods into capabilities) would apply *a fortiori* to the fairness approach as well.

Liberty and Entitlements

A different type of consideration altogether is raised by the place of liberty in a theory of justice. As was mentioned before, Rawls gives it priority. This priority has been questioned by pointing to the possibility that other things (e.g., having enough food) may sometimes be no less important than enjoying liberty without restriction by others. Rawls does, of course, attach importance to these other considerations, but in view of the priority of liberty, they may end up having too little impact on judgements regarding justice in many circumstances, and this might not be acceptable (on this see Hart 1973).

On the other hand, in some other theories of justice, the priority of liberty has been given even greater importance than in the Rawlsian structure. For example, in Nozick's (1974) theory of 'entitlements', rights are given complete priority, and since these rights are characterized quite extensively, it is not clear whether or not much remains to be supported over and above the recognition of rights. Nozick argues against any 'patterning' of *outcomes,* indicating that any outcome that is arrived at on the basis of people's legitimate exercise of their rights must be acceptable because of the moral force of rights as such. These rights, in Nozick's analysis, include not only personal liberty, but also ownership rights over property, including the freedom to use its fruits, to use it freely for exchange, and to donate or bequeath it

to others (thereby asserting the legitimacy of inherited property).

This type of approach has been criticized partly on grounds of what has been seen as its 'extremism', since the constraints imposed by rights can override other important considerations, for example reducing misery and promoting the well-being of the deprived members of the society. In fact, it has been argued that a system of entitlements of the kind specified by Nozick might well co-exist with the emergence and sustaining of widespread starvation and famines, which are often the result of legally sanctioned exercises of property rights rather than of natural calamities (on this see Sen 1981). Although Nozick does refer to the possibility that in case of 'catastrophic moral horrors' rights may be compromised, it is not at all clear how his theory would accommodate such waiving of rights, in the absence of formulation of other, competing bases of moral judgements. On the other hand, there cannot be any doubt that Nozick's theory does capture some notions of justice that can be found in a less clear form in the literature. Nozick's analysis gives a well-formulated and illuminating account of an entitlement-based approach to justice.

Sources of Difference

To conclude, theories of justice explicitly or implicitly invoked in the literature show a variety of ways in which the demands of justice can be interpreted. There are at least three different bases of variation. One source of variation concerns the *metric* in terms of which a person's *advantage* is to be judged in the context of assessing equity and justice. Various metrics have been considered in this context, including utility (as under utilitarianism and other welfarist theories of justice), primary goods index (as in the Rawlsian theory of justice), capabilities index (as in theories emphasizing what people can actually do or be, e.g., Sen 1985b), incomes or commodity bundles (as in the literature on 'fairness', and on statistical measures of poverty, e.g., Foster 1984), various notions of command over commodity bundles and resources (as in some notions of 'equality' developed in the literature, e.g., Archibald and Donaldson 1979; Dworkin 1981), and so on.

A second source of difference relates to the *aggregating* of diverse information regarding the advantages of different individuals. One approach, best represented by utilitarianism, sees nothing being needed to be ascertained other than the *sum-total* of the overall utilities of different people. Insofar as distributional considerations come into this exercise, they enter in the conversion of goods to be distributed into the appropriate metric of individual utilities. For example, inequality in the distribution of incomes may be disvalued in the approach of utilitarian justice because it may lead to a reduction in the sum-total of individual utilities, through (interpersonally comparable) 'diminishing marginal utilities'. Other approaches are more concerned with distributional properties related to the different individuals' relative positions (vis-à-vis each other). The Rawlsian lexicographic maximin is one example of such a distributional concern, and there are others than can be considered, such as adding concave transformations of the individual utility indices (e.g., the additive formula used by Mirrlees 1971, for his taxation assessment), and using various 'equity' axioms (e.g., Kolm 1969, 1972; Sen 1973, 1982; Atkinson 1975, 1983; Hammond 1976, 1979; d'Aspremont and Gevers 1977; Roberts 1980).

The third issue concerns the claimed *priority* of some particular aspect of a person's advantage (e.g., Rawls's insistence on the priority of liberty), *or* nonconsequentialist priority of some processes over results (e.g., Nozick's 1974, view of rights serving as unrelaxable constraints; or ideas of exploration based on counterfactual exercises of shared rights to social resources, e.g., Roemer 1982).

Given the diversity of moral intuitions related to the complex notion of justice, which has been extensively used over centuries to arrive at normative assessment, it is not surprising that various theories of justice have been proposed in the economic and philosophical literature. The exercise of clearly understanding what the

differences between distinct theories of justice consist of (and arise from) is, in some ways, the first task. This essay has been concerned with that task.

See Also

► Justice (New Perspectives)

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Justice (New Perspectives)

Bertil Tungodden

Abstract

This article provides a survey of recent normative work on justice. It shows how the concern for distributive equality has been questioned by the idea of personal responsibility and the idea that there is nothing intrinsically valuable in levelling down individual benefits. It also discusses the possibility of combining a concern for the worse off with a concern for Pareto efficiency, within both aggregative and non-aggregative frameworks, which includes a discussion of the arguments of prioritarianism, sufficientarianism, and welfarism. Finally, the article briefly reviews the modern literatures on rights-based reasoning, intergenerational justice and international justice.

Keywords

Altruism; Behavioural economics; Choice; Compensation; Consequentialism; Difference principle; Egalitarianism; Equality; Equalization; Evolutionary economics; Fair allocation; Fairness; Harsanyi, J. C.; Independence of irrelevant alternatives; Indexing impasse; Infinite horizons; Intergenerational justice; International justice; Interpersonal utility comparisons; Justice; Leximin; Libertarianism; Maximin; Nozick, R.; Pareto efficiency; Pareto indifference; Pareto principle; Poverty;

Poverty alleviation; Preferences; Primary goods; Prioritarianism; Rawls, J.; Responsibility; Self-ownership; Sen, A.; Social welfare function; Sufficiency; Sufficientarianism; Tyranny of aggregation; Utilitarianism; Veil of ignorance; Welfarism; Well-being

JEL Classifications
K0

Modern thinking on justice has been strongly motivated by the work of Rawls (1971, 1993). Rawls not only developed a prominent theory of justice that has been extensively analysed, he also expressed in a very powerful way the fundamental role justice has to play in the evaluation of social arrangements. Rawls argued that justice is the first virtue of social institutions, as truth is of systems of thought. 'A theory however elegant and economical must be rejected or revised if it is untrue; likewise, laws and institutions no matter how efficient and well-arranged must be reformed or abolished if they are unjust' (1971, p. 3).

The fundamental problem is that there are many divergent views of what constitutes a just society, and thus many divergent views of what are just social arrangements. Rawls introduced the notion of a reflective equilibrium, which, roughly speaking, is attained when our principles and judgements of justice coincide. The normative literature on justice can be seen as part of a process towards such a reflective equilibrium, where the aim is to attain a better understanding of both the consequences and the underlying foundation of various possible conceptions of justice.

Further understanding of different conceptions of justice is also important in the positive analysis of individual behaviour, because it is by now well-established that people in many situations are motivated by fairness considerations (Camerer 2003). There is a substantial literature in behavioural economics that study in more detail what kind of fairness norms motivate people and to what extent these fairness norms survive in different settings (Konow 2003), and also an important literature in evolutionary economics that aim at understanding why our concern for justice has evolved (Binmore 2005; Skyrms 1996, 2003).

This article is a sequel to Sen's entry on justice in the first edition of *The New Palgrave: A Dictionary of Economics* (reproduced in this edition), where Sen argues for a broader view of justice than what is captured by utilitarianism (see also Sen 1979). Sen views utilitarianism as the amalgam of three distinct principles, namely, welfarism, sum-ranking, and consequentialism, and he shows how each of them was contested in the early modern literature on justice. In this article, I survey how these questions have been dealt with in recent normative work on justice. In particular, I focus on the role of distributive equality. Sen argued convincingly for the need to take explicit note of inequalities in the distribution of utilities or some other equalisandum, and the standard welfare economic view is presently that justice requires a trade-off between equality of utility and the sum of utility. Interestingly, however, the concern for distributive equality has been questioned from different perspectives. First, it has been argued that distributive equality neglects the role of personal responsibility, and, second, it has been argued that distributive equality legitimizes the intrinsic value of levelling down utilities. I review each of these arguments before I move on to the classical question of how to incorporate equality or a concern for the worse off in an aggregative theory of justice. Any aggregative theory of justice, however, faces what I call the tyranny of aggregation, and therefore, inspired by Rawls (1971), there have been many attempts to establish a non-aggregative framework that combines a concern for equality with a concern for Pareto efficiency. I discuss some of the most prominent non-aggregative perspectives and also some recent developments on rights-based non-consequentialistic reasoning. Finally, I review briefly the growing literature on intergenerational and international justice, which raises interesting questions on how to deal with individuals who are in asymmetric relationships to each other.

Distributive Equality and Personal Responsibility

Modern egalitarian theories of justice seek to combine the values of equality and personal responsibility. The contemporary focus on this relationship can be traced back to Rawls (1971), but it has historical roots both in the US Declaration of Independence (1776) and the French Declaration of the Rights of Man and Citizen (1789). The American and French societies developed in rather different directions, though, and, as noted by Nagel (2002, p. 88), 'what Rawls has done is to combine the very strong principles of social and economic equality associated with European socialism with the equally strong principles of pluralistic toleration and personal freedom associated with American liberalism, and he has done so in a theory that traces them to a common foundation'. The ideas of Rawls have been developed further, notably by Dworkin (1981), Arneson (1989), Cohen (1989), Kolm (1996), Roemer (1993, 1996, 1998), van Parijs (1995), Bossert (1995), Fleurbaey (1995a, b), Bossert and Fleurbaey (1996), and Fleurbaey and Maniquet (1996, 1999), where the main achievement has been to include considerations of personal responsibility in egalitarian reasoning. The two basic conditions put forward in this literature are *the principle of equalization* and *the principle of responsibility*. The principle of equalization states that if two persons have exercised the same level of responsibility, then justice demands that they should have the same outcome in the morally relevant space. The principle of responsibility states that inequalities due to different levels of responsibility can be justified.

A fundamental question is whether the two basic principles can be combined in a coherent theory of justice. Dworkin (1981) proposes the idea of a hypothetical insurance scheme, where each person makes her choice of insurance behind a thin veil of ignorance where everyone knows his or her own preferences and is in the possession of the same amount of resources. The equilibrium outcome in this insurance market forms then the basis for the just compensation of disadvantages in the actual world. The proposal of Dworkin has been criticized by Roemer (1985), who argues that, if individuals maximize their expected utility in the insurance market, they insure against states in which they have low marginal utility. If low marginal utility happens to be the consequence of some inborn handicaps, then the hypothetical market will tax the disabled for the benefit of the others. Hence, if we do not want to hold people responsible for their handicaps, then this approach violates the principle of equalization in the actual world, even though it satisfies it if we define responsibility in relation to the choices behind the veil of ignorance. For a further discussion of this issue, see Dworkin (2002), Fleurbaey (2002) and Roemer (2002a).

Bossert (1995) and Bossert and Fleurbaey (1996) study the compatibility of the principle of responsibility and the principle of equalization within a model where pre-tax income of each person is determined by a vector of factors and where we hold people responsible for some of these factors (for example, effort) and not for others (for example, family background). They show that, if the principle of responsibility is interpreted as saying that people should be held fully responsible for the actual consequences of changes in their behaviour, then it cannot be combined with the principle of equalization. However, such an interpretation of the principle of responsibility can be questioned because in many cases it may imply that inequalities reflect differences that we do not want to hold people responsible for, including their inborn talent (Tungodden 2005). However, there are many other possible interpretations of the principle of responsibility which can be combined with the principle of equalization (Fleurbaey and Maniquet 2008). One possibility is captured by the egalitarian equivalent mechanism, where people face a given reward scheme for their choice of effort and then share equally the deficit or surplus that follows from this scheme.

A basic insight from this literature is that, if we want to satisfy the principle of equalization, then justice requires that people should face the same consequences from the same kind of behaviour. However, this implies that there is a general tension between the just allocation and Pareto

efficiency, where the latter requires that people should face the actual consequences of their behaviour. This tension is not present if one accepts a weaker version of the principle of equalization, which requires complete equalization only for some level of responsibility (Kolm 1996). Such an approach is consistent with holding people fully responsible for the actual consequences of changes in their behaviour, as illustrated by the conditional egalitarian mechanism introduced by Bossert and Fleurbaey (1996).

Another interesting insight that follows from this framework is that an income tax system may be unjust in two different ways. First, it may be unjust because it does not equalize sufficiently among people exercising the same level of responsibility. Second, it may be unjust because it equalizes too much between people exercising different levels of responsibility. Within the more standard framework of welfare economics, where considerations of responsibility are not introduced, the second type of injustice is usually overlooked.

The location of the responsibility cut is essential in any application of a responsible-sensitive egalitarian theory, which is most easily seen by noticing the implications of two extreme cases. No redistribution would be justifiable if all factors are responsibility factors, while, ideally, outcomes should be equalized completely if all factors are non-responsibility factors. If there are both responsibility factors and non-responsibility factors, however, then the ideal level of redistribution also depends on the degree of inequality in the non-responsibility factors. However, it is in general not the case that the ideal level of redistribution is lower if the differences in some non-responsibility factor are eliminated or if we move to a situation where people are held responsible for more factors. This will be the case only if there are no negative correlations between various non-responsibility factors in society (Cappelen and Tungodden 2006).

The standard way of defining the responsibility cut is to rely on the distinction between choice and circumstances, where people are held responsible for their choices but not for their circumstances (Cohen 1989). However, this approach is controversial and raises metaphysical questions about the basis for our choices (Dennet 2003). Alternatively, we may think of the responsibility cut in political terms, whereby people are assigned responsibility for a particular set of factors without relying on a particular metaphysical view of individual choices (Fleurbaey 1995a). The question of where to locate the responsibility cut then mirrors the political debate on redistribution, where right-wingers argue that people should be held responsible for a large fraction of the factors influencing their lives, whereas left-wingers hold individuals responsible for a smaller set of factors.

A further problem in applying this framework is how to obtain a more precise measure of the degree of responsibility a person has exercised. To simplify, suppose that we consider a case where only labour effort and talent affect outcome, and where we do not want to hold people responsible for their talent. Roemer (1993, 1996, 1998) proposes that we partition the population into talent groups, and then consider two individuals identical in terms of responsibility if they are at the same percentile of the labour effort distribution within their class of talent. This approach can be generalized to any number of responsibility and non-responsibility factors by studying conditional distributions more generally. Roemer combines this framework with a maximin interpretation of the principle of equalization and a utilitarian interpretation of the responsibility principle. His proposal equalizes as much as possible among people who have exercised the same level of responsibility, but rewards individuals for additional labour effort only if this maximizes the total amount of utility (or some other equalisandum) within the sub-population consisting of those who receive the lowest level of utility at each percentile of labour effort level. In sum, this provides us with a complete theory of justice, not only the ideal solution, and Roemer (2002b) illustrates how this framework may be applied in studying redistribution policies. Alternative versions of Roemer's framework are studied in Van de gaer (1993) and Ooghe et al. (2006).

Distributive Equality and Prioritarianism

A fundamental critique of distributive equality has been launched in the debate on prioritarianism and egalitarianism (Parfit 1995; Temkin 1993, 2000; Scanlon 2000), where it has been questioned whether even in situations where people have exercised the same level of responsibility we should find distributive equality intrinsically valuable.

Scanlon (2000) argues that equality very seldom seems to be what we care about and that our concern for equality in most cases can be traced back to other fundamental values. We care about a reduction in inequality because, among other things, it contributes to the alleviation of suffering, the feeling of inferiority, and the dominance of some over the lives of others. Parfit (1995) questions the intrinsic value of equality by appealing to *the levelling down objection.* A reduction in inequality can take place by harming the better off in society without improving the situation of the worse off. If equality is intrinsically valuable, then this must be good in some respect. However, to harm everyone cannot be good *in any respect*, and hence inequality cannot be intrinsically bad.

Parfit (1995) suggests that there is an alternative view, what he calls the priority view, which better captures our concern for the worse off and avoids the levelling down objection. Parfit defines prioritarianism as the view that, the worse off people are, the more important it is to benefit them. This, however, is an imprecise statement which does not clearly set apart prioritarianism from egalitarianism, and it has been questioned in the literature whether it is at all possible to distinguish these two perspectives (Broome 2007). As pointed out by Fleurbaey (2007), a prioritarian view will always coincide with an egalitarian view that cares both for total utility (or well-being) and equality, and which measures inequality with the same index that is implicit in the prioritarian view. However, it can be argued that the two perspectives reflect different ways of justifying priority to the worse off. The prioritarian justification focuses on the absolute circumstances of the worse off, while the egalitarian justification focuses on the relative circumstances of the worse off (Tungodden 2003).

Justice, Welfarism and Aggregation

A substantial literature has studied how to combine a concern for distributive equality or the worse off with other values, in particular Pareto efficiency. This raises two core questions. First, we need to establish a metric of individual advantage and, second, we need to determine how much weight to assign to distributive equality relative to other values.

Much of this work has rested on the assumption of welfarism, which states that the social ranking of alternatives must depend only on the utility levels of individuals in these alternatives (Arrow 1951; Sen 1970a; Bossert and Weymark 2002). Welfarism may be assumed as a basic assumption or it may be derived from the more fundamental principles of Pareto indifference and independence of irrelevant alternatives (d'Aspremont and Gevers 1977). There has been a huge literature criticizing welfarism. On the one hand, it has been argued that welfarism contains an unsatisfactory representation of individual advantage. On the other hand, it has been claimed that it is impossible to apply welfarism in practice. We may label these the *pragmatic* and the *fundamental* arguments against welfarism.

The underlying idea of the pragmatic argument is that we 'must respect the constraints of simplicity and availability of information to which any practical policy conception [of justice] is subject (Rawls 1993, p. 182). Welfarism implies that interpersonal comparisons should be based on comparisons of preference satisfaction, which in general is considered to be non-observable. Thus, the welfaristic framework does not provide a practicable public basis for considerations of justice.

The fundamental critique of welfarism is concerned with the substantive claims of this framework. Rawls (1971, 1993) argues that utility or well-being is not a relevant feature of states of affairs. Appropriate claims should refer to an idea of rational advantage that is independent of any particular comprehensive doctrine of the good, and for this purpose Rawls suggests a list of primary goods. Sen (1985, 1992a) defends the focus on well-being in social choices, but he argues against the idea of well-being implicit in

welfarism. Sen introduces the framework of functionings and a capability set, where functionings are the various things that a person may value doing or being (for example, being adequately nourished, free from avoidable disease, and able to take part in the life of the community) and the capability set is the set of alternative functioning vectors available to her.

The proposals of Rawls and Sen differ, but formally they are closely related; social alternatives are characterized by a vector of valuable elements assigned to each individual. However, this raises the fundamental question of how to trade off gains and losses in the various dimensions for each individual. On possibility, as first suggested by Rawls (1971), is to establish an objective index as the basis for interpersonal comparisons in a theory of justice. The problem with this approach, as observed by Gibbard (1979), is that this in general will violate the Pareto principle. Some people will have preferences that are in disagreement with how the index implicitly makes the trade-off, and thus we face what is commonly named the indexing impasse (Sen 1996a; Plott 1978; Blair 1988; Arneson 1990). Sen suggests that the indexing impasse follows from not taking note of the citizens' preferences when constructing the index, and he argues in favour of an intersection approach which articulates only those judgements that are shared implications of all the preferences present in society. However, as shown by Fleurbaey and Trannoy (2000), Brun and Tungodden (2004), and Pattanaik and Xu (2007), this approach does not solve the problem. In any society where people have heterogenous preferences, the intersection approach runs into a conflict with the Pareto principle.

A related argument has been put forward by Kaplow and Shavell (2001, 2002). They argue that any notion of fairness or justice that implies a violation of the Pareto indifference principle will also imply a violation of the standard Pareto principle if we accept a minimal continuity condition. They apply this insight to argue against any notion of fairness or justice that does not rely on individual utilities. However, there are alternatives to welfarism that are consistent with the Pareto principle (Fleurbaey et al. 2003). In particular, there is a literature on fair allocation which exploits the fact that with a richer description of the social alternatives we may apply considerations that rely on the shape of the indifference curves of individuals when establishing a justice ranking (Fleurbaey 2003; Fleurbaey et al. 2005; Fleurbaey and Maniquet 2006). This approach violates Arrow's independence of irrelevant alternatives, and thus shows that this condition is far from innocent in an analysis of justice.

If we now turn to the question of how much weight to assign to the worse off, then the answer may depend on our assumptions about the informational framework (Bossert and Weymark 2002). If we assume that there is a one-dimensional measure of individual benefits (which may be utility) and no constraints on interpersonal comparability, then there is a vast number of theories of justice satisfying the Pareto principle. Hence, we need to impose other ethical conditions on the justice ranking in order to choose among the set of possible theories. One possibility is to appeal to conditions that only cover two-person situations, that is, situations where only the benefits of two persons differ in a comparison of two social alternatives, and it turns out that these conditions are extremely powerful in an analysis of this kind (d'Aspremont 1985). By way of illustration, the utilitarian and the leximin ranking follows almost directly from assuming two-person utilitarianism and two-person leximin within such a framework.

Within this informational framework, one may also show that any aggregative theory faces what we may name the tyranny of aggregation (Tungodden 2003), whereby the interests of the worse off may be outweighed by the interests of a sufficiently large number of better off, even though the gain of each of the better off is *infinitesimal*. Although the tyranny of aggregation is well-known in the context of utilitarianism, it is important to note that this applies to any aggregative approach to social choices, including any aggregative prioritarian rule. This raises the question of whether an aggregative approach can constitute the basis of a theory of justice.

Justice and Non-Aggregation

A core element in Rawls's theory of justice is precisely that each person possesses an inviolability that makes aggregation impermissible. This is expressed both in the absolute priority assigned to the fulfilment of basic liberties and in the difference principle. Rawls aimed at justifying a non-aggregative approach by a constructive theory whereby people choose fairness principles behind a veil of ignorance. An extensive literature has questioned this conclusion, and following Harsanyi (1955) it is commonly argued that the veil of ignorance approach implies some version of utilitarianism (Weymark 1991; Broome 1991; Mongin 2001; Mongin and d'Aspremont 2002).

However, there are other ways of justifying a non-aggregative approach to distributive justice. One possibility is to combine a concern for equality promotion with a concern for Pareto efficiency (Barry 1989). Tungodden and Vallentyne (2005) have investigated this approach, where the basic idea is that distributive conflicts ought to be solved by choosing the more equal distribution. They show that any consistent theory of justice satisfying this approach has to assign strict priority to the worst off in society. This result is closely related to the formal results developed by Hammond (1975) on extreme inequality aversion, and questions the claim of some philosophers that the leximin principle is not consistent with a concern for equality (McKerlie 1994).

Another interesting non-aggregative approach has been suggested by Nagel (1979) and Scanlon (1982, 1998). They both argue that justice requires pairwise comparisons of individual claims, where the just solution is to satisfy the individual with the most urgent claim. In other words, they reject the argument that the number of persons with a particular claim should count (Taurek 1977). They do, however, defend the view that, in order to measure the urgency of a claim, one should take into account both gains and losses and the absolute circumstances of an individual. Hence, the aim is to outline a theory of justice that lies in the middle ground between leximin and the standard aggregative perspective. It turns out, however, that it is impossible to establish such a middle ground within a framework satisfying some basic consistency conditions (Tungodden 2003).

Frankfurt (1987) proposes the doctrine of sufficiency, which says that justice plays no role if everyone has enough. This may be interpreted as a non-aggregative approach, whereby absolute priority is assigned to those below the sufficiency threshold. There are two fundamental and interlinked issues within this framework. First, one needs to define what it means to have enough. Second, one needs to justify why justice is not an issue among those who have enough. Anderson (1999), who appeals to the notion of democratic equality, may be seen as one way of developing Frankfurt's proposal, where people have enough if they have what is sufficient to stand as an equal in society. Crisp (2003), on the other hand, relates the idea of sufficiency to the notion of compassion, where priority should be given to the worse off only when their circumstances warrant the compassion of an impartial spectator. Underlying both these proposals is the perspective that the role of justice is limited, which of course does not exclude the possibility that there are other reasons for caring about the circumstances of people above the sufficiency threshold.

The standard view within economics is to think of justice as unlimited, that is, as relevant independent of people's circumstances. However, it is commonly recognized that by far the most pressing problem of justice in the modern world is the presence of poverty, and this has caused a substantial literature on the definition and measurement of this concept (Sen and Foster 1997). Given any definition of poverty, absolute or relative, there is then the further question of how to fit this into a more general theory of justice. One possibility is a non-aggregative approach, where strict priority is given to the alleviation of poverty but where this is combined with a concern for distributive justice among those who do not live in poverty. Interestingly, this scheme is formally closely related to the structure of the difference principle as suggested by Rawls (1971). Rawls proposed that a relative threshold should define the worst-off group, and that we should assign

strict priority to the expectations of this group (and not only the worst-off individual). However, it turns out that a relative definition of the worst-off group does not make room for an interpretation of the difference principle that differs from the standard leximin interpretation (Tungodden 1999). Hence, an absolute threshold is needed to build an alternative non-aggregative theory of justice to leximin.

Any non-aggregative theory of justices faces what we may call the tyranny of non-aggregation, that is, it sometimes justifies that minor improvements in the lives of some people should outweigh great losses for any number of better-off people. This may seem as a knock-down argument against a non-aggregative approach. However, it is important to have in mind that by rejecting a non-aggregative approach one accepts the tyranny of aggregation, since there does not exist any reasonable theory of justice that avoids both the tyranny of aggregation and the tyranny of non-aggregation.

Libertarianism, Rights, and Consequentialism

We have argued that a non-aggregative theory of justice has to assign absolute priority to the worse off, and thus such a theory provides a strong protection of the rights and liberties of this group. However, this may imply the violation of the rights of others. Libertarianism, on the other hand, holds that all agents are, initially at least (for example, prior to engaging in any commitments or unjust actions), full self-owners, and that any violation of full self-ownership is unjust. The core idea of full self-ownership is that agents own themselves in just the same way that they can fully own inanimate objects.

The modern interest in libertarianism was initiated by the work of Nozick (1974), who not only defended full self-ownership but also the view that people should be free to appropriate parts of the external world as long as no one be left worse off with the appropriation than she would be if the thing were in common use. This view of just appropriation of the external world has recently been challenged by left-libertarians, who argue that people have joint ownership of natural resources (Moulin and Roemer 1989; Steiner 1994; Vallentyne and Steiner 2000; Otsuka 2003). If we accept the premise of joint ownership, then it follows that natural resources may be justly appropriated only with the permission of, or with a significant payment to, the other members of society.

The work of Nozick (1974) was partly motivated by Sen's liberal paradox (Sen 1970b; Gibbard 1974), where Sen shows that there is a conflict between respecting the Pareto principle and protecting a private sphere to each individual in society. This work has initiated a large literature, which has studied alternative formulations of individual rights. In particular, it has been argued that rights should be formulated as the admissibility of actions or strategies of individuals and not as the right to impose one's preferences on the ranking of a particular set of social alternatives (Gaertner et al. 1992). However, as pointed out by Sen (1992b, 1996a), even though this provides an interesting alternative formulation of rights, it does not in itself eliminate the tension between the Pareto principle and individual rights.

Libertarianism in its various forms provides one way of justifying individual rights, but the right-based perspective is certainly not exclusive to libertarianism (see, for example, Rawls 1971, 1993; Kolm 1996; van Hees and Dowding 2003). Moreover, a rights-based perspective does not necessarily have to be non-consequentialistic in the sense that it imposes side constraints that cannot be overridden by other considerations of justice. It is possible to defend a consequentialistic rights-based approach, where the best overall outcome, as judged from an impersonal standpoint which gives equal weight to the interest of everyone, is to minimize the violations of some basic rights or liberties (Scheffler 1988). In fact, it has also been argued that side constraints and agent relativity can be accommodated by consequential reasoning if we adopt a positional view of consequences (Sen 1982, 1993). Finally, we should note that rights and liberties also may be justified on instrumental grounds, as a way of generating good consequences.

Intergenerational Justice and International Justice

The intergenerational perspective introduces several interesting challenges to a theory of justice (Parfit 1984). First, we have to consider how to deal with the non-identity problem of future people, which questions whether people that are born as a result of a particular set of policies can be harmed by these policies, given that they would not have been born at all otherwise. Second, we have to consider how to avoid the repugnant conclusion, namely, that for any given affluent population there is a better world with more people, but where everyone has an arbitrarily low level of utility or well-being. This conclusion follows from two intuitively plausible conditions, namely, that we make the world better by bringing in people who have a life worth living and that we do not make the world worse by making it more equal (at least as long as this does not reduce the total amount of utility in society). Blackorby et al. (1997, 2005) propose critical-level utilitarianism as the best possible solution to these problems, where critical-level utilitarianism disvalues only individuals whose utility level is below some fixed, low but positive threshold.

The literature on intergenerational justice has considered how to formulate a criterion of justice when there is an infinite number of generations. The basic problem was raised by Diamond (1965), who proved that within this framework it is impossible to construct a social welfare function that satisfies the Pareto principle, a principle of intergenerational equity and continuity. Basu and Mitra (2003) strengthen this result by proving that the continuity condition is superfluous. In other words, the fundamental conflict is between the Pareto principle an intergenerational equity. However, the literature also contains positive results, which show that a criterion for intergenerational justice can be formulated with an infinite horizon if one moves away from the framework of a social welfare function (Asheim et al. 2001; Asheim and Tungodden 2004; Basu and Mitra 2003, 2007; Bossert et al. 2007; Fleurbaey and Michel 2003).

Rawls (1971) limited his theory of justice to the circumstances of a nation, and recently this has been questioned by a number of philosophers (Pogge 1989, 1992, 1994, 2001). They find any distinction between people based on territory arbitrary, and thus argue in favour of applying Rawls's principles of justice on the global scale. Consequently, they claim that the situation of the worst-off members of the global, rather than the domestic, society ought to be the starting point for considerations of justice. This view has been rejected by Rawls (1999), who argues that there is no basic structure in the international arena that can be the primary subject of social justice, and the difference principle cannot be a demand of justice in the international realm because, among other things, the justification of the difference principle has merit only between persons who cooperate in the way that this is done within the nation state.

Concluding Remarks

The normative literature on justice has expanded enormously in recent years, with an extremely fruitful exchange of ideas between the disciplines of economics and philosophy. As a result, we now have a much richer understanding of how to think about the various possible conceptions of a just society. Still, there are many unresolved questions in the literature. Let me briefly mention three of them. First, there is a need further study of how to combine egalitarian ideas of responsibility with a concern for efficiency. Basic economic theory tells us that the efficient solution is to let individuals face the actual consequences of their choices, but this is clearly to hold individuals responsible for too much in many situations. How should we deal with this tension in a just society? Second, there is a need for further study of the metric of individual advantage. There are a number of suggestions present in the literature, including primary goods, basic needs, functionings and capabilities, but still need for more research on how to combine these approaches with a respect for individual preferences and choices. Finally, there is a need for further analysis of the prioritarian proposal. The core question within prioritarianism is how much more weight to attach to the worse off, and presently

we lack a clear understanding of how to move forward on this issue.

See Also

- ▶ Egalitarianism
- ▶ Ethics and Economics
- ▶ Justice
- ▶ Libertarianism

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