

An Early Estimate of the Value of Australia's Stock of Human Capital

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A concept of capital restricted to tangible property will not do. A much more comprehensive concept of capital is required – one that will include human capital (Schultz 1959: 117).

Introduction

In January 1923 Charles Wickens, the then Commonwealth Statistician for Australia, delivered the presidential address to Section G (Social and Statistical Science) of the sixteenth meeting of the Australasian Association for the Advancement of Science. His address, entitled 'Human Capital', provided an estimate of the value of the stock of human capital in Australia for 30 June 1915 that was about three times the value of the nation's 'material capital, both private and public' at the time (Wickens 1924: 554).

The estimate pre-dates by nearly forty years what Blaug (1976: 827) has called the 'birth of human capital theory'. Yet it is not mentioned in Kiker's (1966, 1968) surveys of early work on human capital; and, apart from brief and contrasting evaluations by Goodwin (1966: 491-2) and Castles (1998: 11-12), it appears to have been neglected by historians of Australian economic thought.

This paper seeks to identify the place of Wickens among the pioneers of the measurement of human capital. After describing Wickens's methodology, the paper traces the relationship Wickens's work bears to other early work on the measurement of human capital. It emerges that both Goodwin's dismissal of Wickens's contribution as 'little more than an academic exercise' and Castles's claim that 'Wickens was decades ahead of his time' require substantial qualification.

Wickens's Methodology

Wickens used the term 'human capital' to describe 'the human portion of the community's wealth', including 'the whole human element, and not merely that portion which is engaged in so-called "productive" labour' (Wickens 1924: 536). Thus he was concerned with the stock of wealth embodied in the total population of Australia. In particular, he sought to value this stock at 30 June 1915.

After noting the availability, in principle, of two alternative valuation approaches, the 'capitalization-of-earnings' method and the 'cost-of-production' method, Wickens chose the former. Specifically, he used a version of the 'capitalization-of-earnings' method that involved estimating the total discounted value of all the future streams of services expected to be rendered by members of the population. These services (or 'earnings') were valued in gross terms, with no deduction for the 'cost of maintenance'. Wickens justified this procedure in the following terms:

.... that portion of the services of any instrument of production which is available to furnish satisfactions of any kind whatever to the owner

of the instrument represents the income of the community in respect of that instrument. When the owner and the instrument are identical, the whole of the services rendered by the instrument are available to furnish satisfactions to the owner, and hence the gross services should be treated in a valuation of the income of the community (Wickens 1924: 547).

Wickens (1924: 543) recognised that '[t]he services rendered by different members of the community vary considerably in their value, and a detailed assessment of such values would be a matter of much difficulty'. He therefore simplified his task by dividing the population into three broad groups and abstracting from differences within these groups, other than those relating to gender and life-expectancy. The groups were adults of working age (males aged 18 to 64 and females aged 18 to 59), juveniles (persons under the age of 18), and the aged (males aged 65 and over and females aged 60 and over).

With respect to the first group, Wickens assumed that all adult males and females of working age were rendering services that in weekly terms had values equal to official estimates of weighted average weekly wage rates for adult males and females respectively for the year ended 30 June 1915. Allowing four weeks of 'lost time' per year to cover factors such as unemployment and unpaid holidays, the corresponding annual figures were £133 for males and £65 for females. The application of these figures to the whole adult population of working age, and not to a narrower, more conventional measure of the adult labour force, was a reflection of Wickens's focus on 'the whole human element' in the community's wealth. In today's terminology, the application may be interpreted as an attempt to include the value of non-market labour services, including unpaid household activities, as well as services associated with paid employment.

Wickens further assumed that his estimates for 1915 would also be applicable to later years. In particular, ignoring the possibility of future productivity growth, he assumed that all surviving adult males would render a constant annual flow of services of £133 until the age of 65, and all surviving adult females would render a constant annual flow of services of £65 until the age of 60. Using the Australian Life Table, 1901-10, to estimate survival probabilities, and an annual interest rate of 5 per cent, he then calculated the total present values of the services that males at every age from 18 to 64 could be expected to render over the rest of their working lives. He also calculated corresponding values for females at every age from 18 to 59.

The second group in Wickens's classification of the 1915 population was persons under the age of 18. These were assumed to provide 'no services to age of 18, and adult services thereafter' (Wickens 1924: 547). Wickens acknowledged the existence of 'juvenile earnings', but argued that this assumption appeared 'sufficient for aggregate purposes' (Wickens 1924: 547). Moreover, since he had already computed the present values of the future services of males and females aged 18 to be £2,245 and £1,082 respectively, it meant that the calculation of corresponding values for juveniles was '[a]ctuarially ... simple, all that is involved being the determination for ages 0 to 17 of the value of a pure endowment of £2,245 in the case of males, and £1,082 in that of females, to be entered upon at age 18' (Wickens 1924: 546).

The final group (the aged) consisted of persons who had reached the ages at which old-age pensions were payable, 65 for males and 60 for females.

Although he implicitly assumed that members of this group were no longer providing labour services, Wickens (1924: 548) argued that:

The fact that in Australia, as elsewhere, the people, through their Legislature, voluntarily tax themselves to provide for the maintenance, by way of old-age pensions, of aged persons, is evidence that the aged have a value – sentimental or other – in the eyes of the community; and, following the maxim that anything is commercially worth what the public are willing to pay for it, it would appear that the aged in Australia are worth at least the capitalised present value of their old-age pensions.

Again using the Australian Life Table, 1901-10, and an annual interest rate of 5 per cent, Wickens provided estimates of this value for males at each age from 65 to 104 and for females at each age from 60 to 104.

Wickens's treatment of the aged was consistent with his broad definition of human capital. It was, however, not consistent with his treatment of the younger groups in the population since he had made no attempt to include in the capitalised present values of juveniles and adults of working age the contributions to their present values that could be expected from them in old age. Nevertheless, he now had estimates of per capita present value for males and females at each age from zero to 104. From there, he could have computed a value for the total human capital stock of Australia by taking the number of persons in each of the gender-age categories, multiplying by the corresponding estimate of per capita present value, and aggregating the results. However, he rejected this procedure on the grounds that the results he had so far obtained did not warrant 'so great a degree of refinement' (Wickens 1924: 553).

Instead, opting for a briefer, more approximate approach, Wickens re-divided the male and female populations into broad age-groups (under 15, 15 to 64, and 65 and over) that were slightly different from those he had already used, and identified median ages for the new groups.¹ He then multiplied the per capita present value for persons of median age in each group by the total number of persons in the group. Aggregation of the resulting estimates of the total human capital of each group yielded a figure of £6,211 million for the human capital of Australia as a whole (£1,246 per head of population) at 30 June 1915. By comparison, Knibbs (1918: 153) had estimated the private material capital stock existing in Australia at the same date to be £1,620 million, while Wickens's (1924: 542) own estimate for publicly-owned material assets was £517 million. These two figures gave a total physical capital stock of £2,137, or only 34 per cent of the estimated value of the stock of human capital.²

Although Wickens's main focus was on the estimation of the value of the stock of human capital using the capitalisation-of-earnings approach, he also used the alternative cost-of-production approach to calculate, more or less as an aside, the 'capital outlay' incurred in raising a child to age 15. Accumulating annual costs of child-rearing, including educational costs, at an interest rate of 5 per cent per annum, and allowing for childhood mortality ('wastage'), he estimated that the mean total 'cost of production' of males and females to age 15 was £436. After comparing this figure with his estimates of the present value of the future 'earnings' (services) of males and females at that age, namely £1,923 and £928, he suggested that:

[a] somewhat fanciful interpretation of the result would be obtained by considering juniors below the age of 15 as being extraneous to the

community and as having cost on the average £436 per head to produce as at age 15. At this age these juniors might be considered as entering upon citizenship, and as having, in respect of future service, the present value indicated above. In other words, their value to the community as a whole, of which they form part, is very much greater than their cost of production (Wickens 1924: 552).

In yet other words, children appeared to be a worthwhile investment in human capital from the viewpoint of the Australian community as a whole. This conclusion neatly complemented and supported an example Wickens used in an introductory passage of his presidential address to explain his concern with human capital:

most of us, I think, must now fully realize that there can be no worse policy in any community than that under which the health of the citizens is sacrificed to the increase of material goods, particularly when that sacrifice occurs, as in the past it has frequently occurred, amongst the children (Wickens 1924: 537).

Some Precursors

Although Wickens did not include a bibliography or detailed citations in his paper, he referred explicitly to the work of two previous contributors in the field of human capital. One was Irving Fisher who, a quarter of a century earlier, had simplified the concept of capital by defining it as 'a quantity of wealth existing at an instant of time', and then gone on to observe that '[t]aken literally, the formula for wealth includes man himself' (Fisher 1897: 199, 201). The other was the nineteenth-century British demographer, William Farr, who devised what Kiker (199: 482) claims was '[t]he first truly scientific procedure ... for finding the capital or money value of a human being'.

Farr's procedure was to estimate the present value of the excess of future earnings over the cost of future maintenance, adjusted (in accordance with a life table) for the probability of death (Farr 1853; 38-44). As noted by Wickens (1924: 548), the outcome was 'that for certain advanced ages the values obtained were negative' because 'the present value of the future cost of maintenance of the persons concerned exceeds the present value of the future earnings of such persons.' He then argued:

This may be true in a purely material sense, and yet it may be inadmissible to assume that the presence of such persons in the community diminishes the human capital of the community, as would necessarily be the case if negative values were allowed to stand in when an aggregation of the items was being made (Wickens 1924: 548).

In his own work, of course, Wickens avoided the problem of negative values by ignoring maintenance costs and capitalising only the gross flows of earnings or, more broadly, the value of services provided by individuals. Nevertheless, Farr's 'net' approach retained support among those of Wickens's contemporaries (e.g. Dublin and Lotka 1930) who sought to measure the value of the individual to others in the community, such as the individual's immediate family or dependants, as distinct from the value of the individual to the community inclusive of that individual.

Whatever the merits of the claim that Farr's technique was the 'first truly scientific procedure' for valuing an individual, attempts to value a nation's stock of human capital as a whole date from a far earlier period. In *Verbum Sapienti* written in 1665, but not published until 1691, Sir William Petty calculated the value of the human capital stock in England and Wales by, in effect, treating the national wages bill as a perpetual flow and applying a discount rate of 6 per cent (Hull 1899: 108). Gregory King, writing in about 1696, adopted a similar approach for 1688 (King 1973: 47).

Kiker (1968: 454-64) identifies several other, much later, attempts that also pre-date Wickens. Two of some relevance to Wickens's work are those of Nicholson (1891) for the United Kingdom, and Barriol (1910, 1911) for France, various other European countries and the United States.

Nicholson provided an estimate of what he termed the 'living capital' of the United Kingdom, which was nearly five times the estimated value of its material wealth. Arguing that 'Petty was justified in valuing the people as he valued the land - both are permanent sources of income' (Nicholson 1891: 100), his method was primarily one of capitalising the income of labour on the assumption that it was a perpetual flow. There were, however, two novel features in his approach.

First, he adopted a definition of the income of labour far broader than the conventional wages and salaries concept. It also covered the returns to labour embodied in the incomes of the self-employed, and all property income originating within the country in excess of an amount corresponding to a 'pure' 3 per cent rate of interest. Nicholson (1891: 101) interpreted this excess as a return to the labour provided by capitalists in maintaining and employing their capital.

Second, Nicholson foreshadowed Wickens's concern with the 'the whole human element' (including the aged) by extending his estimate of the value of living capital to take account of 'domesticated humanity', that is, people regarded as valuable 'things in themselves' (Nicholson 1891: 105). In contrast to Wickens, however, Nicholson chose to value 'domesticated humanity' on the basis of its accumulated cost of production or maintenance. In particular, he estimated the total value of 'domesticated humanity' by assuming the same cost for all persons in the population. As a result, he was criticised for double-counting:

While we may agree that the whole of the cost is required to produce the persons who are valuable as 'things in themselves' and not merely as wage-earners, at the same time and for the same expense wage-earners are produced, and, therefore there appears to be a certain duplication of values when such cost of production is added to the capitalised value of the wages earned by the persons whose costs of production we have estimated (Boag 1916: 15).

Barriol's work is perhaps the most frequently cited, and certainly the most ambitious, contribution to human capital estimation in the first quarter of the twentieth century. It used a methodology that resembled Farr's in certain key respects, although (anticipating Wickens by more than a decade) Barriol did not deduct maintenance costs when computing the 'social value' of an individual.

Barriol (1910: 553) defined 'social value' as the total amount an individual restores to the community out of his or her earnings or, in effect, the individual's total consumption expenditure. Implicitly assuming that lifetime expenditure equalled lifetime income (Kiker 1966: 489), he calculated the 'social values' of French male labourers at different ages by discounting their future

expenditures, adjusted for the risk of death, at an interest rate of 3 per cent. To estimate the per capita value of the human capital stock for each of his selected countries, he used the age distribution of its population to derive a weighted average of the 'social values' of French male labourers at different ages, and adjusted the result to allow for international differences in wage levels, and gender differences in wage and labour force participation rates (Barriol 1911: 358-9).

Finally, R. M. Johnston, Government Statistician of Tasmania from 1882 to 1918, warrants inclusion in any list of precursors of Wickens, if only because of the Australian focus of his work. Described by Goodwin (1966: 480) as 'one of the most remarkable intellectual figures in nineteenth century Australia',³ Johnston (1898, 1904, 1918) advocated the inclusion of human capital in the measurement of wealth, and illustrated its numerical significance with a series of broad-brush calculations relating mainly to Tasmania. His 1918 paper provided perhaps the clearest expression of his ideas:

The mere expenditure of a year's labour - time, energy and skill, by man - the greatest of all instruments of production, no more destroys the whole of his life's capital energy value, as an economic producing instrument, than can a single year's tear and wear wholly destroy the remaining capital value of his, often shorter-lived, inanimate tools and instruments of production. If the still unexhausted producing power of the latter be assessed as having a 'present capital value' based on their estimated years' life of annual revenue-yielding power, it is, surely, reasonable to infer that 'man' the major revenue-yielding instrument of production - with a life-expectation practically interminable (as regards the ever-continuous State breadwinner) should also be assessed on the same basis, as an element - indeed the principal one - of the real accumulated capital wealth of a State at any point of time (Johnston 1918: 2).

Johnston applied this line of argument (which points directly back to the methodology of Nicholson and, ultimately, Petty) to the annual income of the 'existing 82,441 breadwinners of Tasmania ... Regarded as an interminable annuity at 4 per cent, it represents a present value capital of £179,906,075' (Johnston 1918: 3).⁴

Johnston, however, also argued that 'this capital value cannot altogether be set down to the credit of the existing breadwinners' because, during their childhood:

anterior-labour services of parents or natural guardians were expended upon the young future breadwinners in the form of protection, shelter, food, clothing, education, etc., which (for a period of 15 years, say, at £18 per annum, at 4 per cent. interest) would accumulate to a sum of £360, as an element of capital value, which, logically, must be assumed as being incorporated in the existing 82,441 Tasmanian breadwinners, regarded in the light of economic instruments of production. In the aggregate this amounts to £29,678,760 of present capital value (Johnston 1918: 3).

Johnston did not explicitly interpret this retrospective figure as past investment in human capital, but the methodology by which it was derived clearly has much in common with the approach Wickens used five years later to evaluate the 'capital outlay' involved in rearing a child.⁵

Assessments

Wickens's paper initially attracted a certain amount of attention, if only within Australia. In 1925, as noted by Castles (1998: 11-12), a Tasmanian Government committee inquiring into Tasmania's disabilities under Federation used Wickens's estimate of the cost of rearing and educating a child to quantify the costs to Tasmania of emigration to the mainland states (Tasmania. 1925); and five years later another report on Tasmania's disabilities, this time by the Commonwealth Parliament's Joint Committee of Public Accounts, also drew on Wickens's contribution (Australia 1930: 35).

Interest in Wickens's work, however, was never widespread and appears to have soon died away. One possible reason may have been Wickens's failure to update his human capital figures. In August 1924, less than two years after presenting his estimate of the value of the stock of human capital in Australia at 30 June 1915, Wickens (1926) provided estimates of the private material capital stock and public assets for 30 June 1921; but despite the availability of new demographic data from the 1921 census, he did not take the opportunity to offer a corresponding estimate of the value of the human capital stock for 1921.

Another (probably more important) reason for the limited and declining interest in Wickens's work was an emerging tendency for economists, in their search for an index of national well-being, to focus less on measurement of the stock variable, wealth, and more on measurement of the flow variable, national income. Frederic Benham (1928) exemplified this tendency. Having himself constructed an estimate of the national income of Australia for 1924-25, he was prepared to use 'National Assets' (national wealth less external indebtedness) only as a 'supplementary test' of prosperity.

In any case, Benham was not willing to include human capital as part of 'National Assets'. He wrote of Wickens's work:

Upon the basis of 'capitalisation of earnings' and 'cost of production' he valued the 'human capital' of Australia, upon June 30th, 1915, at £6211 millions, or £1246 per head of population. I do not propose to take account of this item. If a human being is an asset because he contributes to production, he is also a liability because he shares in what is produced (Benham 1928: 85).

This terse evaluation is itself subject to three criticisms. First, Wickens did not use the cost-of-production method in valuing the stock of human capital in Australia. It was confined to the separate exercise of estimating the cost of child-rearing. Second, as shown by his valuation of the aged, Wickens did not treat human beings as assets merely because of their contributions to production. Third, Benham's claim that a human being is liability, as well as an asset, to the community overlooks or disregards Wickens's argument against deducting maintenance costs from the value of the services humans provide. (Benham's claim amounts to an extreme 'stock' version of the argument that maintenance costs should be 'netted off' the value of the services humans provide.)

A literature search has found no further references to Wickens's work on human capital until the publication of Goodwin's *Economic Enquiry in Australia* in 1966. The chapter on 'Economic Statistics' in this monumental study of Australian economic thought from the early days of European settlement until 1929 includes discussion of the work of both Johnston and Wickens on human capital. Unfortunately, judging from the inaccuracy of his summary of Wickens's

methodology, Goodwin (like Benham nearly 40 years earlier) misunderstood the nature of Wickens's estimate:

Wickens calculated the 'cost of production' and 'capitalized earnings' of Australian workers at all ages, and he identified the difference in these two amounts as an element of national wealth On this basis Wickens arrived at a total capital value of Australian labor (Goodwin 1966: 491).

Goodwin also appears to have misunderstood the nature of Wickens's later work, reporting that 'In 1924 Wickens revised his wealth estimate using population data produced by the 1921 census' (Goodwin 1966: 491-2). In the context in which it is written, this statement seems to imply that the revision included the human capital component of wealth, when, in fact, as we have seen, Wickens's 1924 paper deals only with estimates of the private material capital stock and public assets for 30 June 1921.

Nevertheless, Goodwin's summary assessment of Wickens's contribution can be considered independently of these misperceptions. 'The basic fault' with Wickens's analysis, according to Goodwin, was:

the awkwardness and unrealistic character of the aggregates. The crucial dynamic element in the calculations was the level of income flowing to productive factors, and fictitious capitalization of non-marketable assets, although likely to correct some popular fallacies, was little more than an academic exercise (Goodwin 1966: 492).

Goodwin did not explain why he thought Wickens's aggregates were awkward and unrealistic, but it is not difficult to suggest criticisms along these lines. Although Wickens took pains to justify at least some of the sweeping assumptions that appear to have been forced upon him by data constraints, the fact remains that he made only rudimentary allowances for the influences of age and labour market conditions, and none at all for the influences of education and productivity growth, when valuing the services expected to be rendered by different members of the population. In addition, his use of median-age present values in the final stage of constructing his estimate of the national stock of human capital appears to have been an unnecessarily crude and possibly distorting short-cut method of aggregation.

On the other hand, Goodwin's dismissal of Wickens's work as 'little more than an academic exercise' seems inconsistent with his judgement that it was 'likely to correct some popular fallacies'. Indeed, it also seems inconsistent with his evaluation of Johnston earlier in the same chapter of *Economic Inquiry in Australia*. There Goodwin had drawn attention to Johnston's previous exposure of these fallacies when he referred to the latter's insistence that the bulk of the capital stock consisted not of tools, equipment and natural resources, but of the capitalised value of labour services:

Johnston regarded statistical calculations of 'national wealth', such as that made by Coghlan for Australasia, as misleading and a reason why radical thinkers were excessively pre-occupied with the ownership pattern of physical capital. Summations of national wealth which included only the value of tangible real goods and neglected the overwhelming importance of potential labour distorted the appearance of forces able to direct income (Goodwin 1966: 481).

Yet, at the same time, and in contrast to his treatment of Wickens, Goodwin made no attempt to disparage Johnston's much more primitive attempts to quantify the contribution of capitalised labour services to the value of the capital stock.

Goodwin's discussion of Wickens coincided with the rapid burgeoning of modern research on human capital. However, because the discussion was confined to a couple of pages in a wide-ranging 600-page tome in a relatively unfashionable area of study, and perhaps also because of its coolness of tone, it failed to rescue Wickens's contribution from the obscurity in which it had rested for many years. And there the contribution remained, apart from the odd passing reference (Dillon and McFarlane 1967: 421, Lancaster 1974: 78), until Ian Castles, himself a former Australian (Commonwealth) Statistician, recently brought it to light in an elegant essay on the Australian population debate of the 1920s (Castles 1998).

Castles writes that 'Wickens's paper anticipated an approach to the measurement of "wealth" which is still seen as novel and important' and (as quoted in the introduction to this paper) that 'Wickens was decades ahead of his time' (Castles 1998: 11). These are bold claims. Castles seeks to support them by reference to the attempts of the World Bank in the mid-1990s to develop 'new' measures of national wealth incorporating natural and human capital, as well as produced assets (World Bank 1995; Serageldin 1996).

The World Bank's estimates of its new concept of wealth covered 192 countries in approximately the year 1990. The human capital (or, as the Bank prefers to call it, human resources) component was:

based on a green measure of net national income, discounted at 4 percent a year over the remaining life expectancy of the population of the country. This sum was then reduced for the parts that were already accounted for by produced assets or by natural capital; the residual constitutes the estimated value of human resources (Serageldin 1996: 14).

Comparison of this methodology with that used by Wickens may well seem to support Castles's claims. Moreover, other relatively recent work does not provide any fundamental conceptual advance on Wickens's basic approach. For example, Graham and Webb (1979) provide estimates for 1969 of the aggregate stock of human capital embodied in U.S. males aged 14 to 75 which, while they carefully avoid over-simplifications of the type associated with Wickens's sweeping assumptions, are still measures of discounted present-value lifetime returns.

To show that modern research on the measurement of the value of a nation's stock of human capital involves no fundamental conceptual advance on the work of Wickens does not, however, establish the originality, or what Castles (1998: 11) calls the 'novelty', of that work. To do so requires scrutiny of earlier writers; and, in this regard, we have already identified the contributions of some of the precursors of Wickens in the measurement of human capital stocks. Notwithstanding various novel elements in Wickens's methodology, these contributions indicate that in at least a general sense he built upon conceptual foundations laid by previous generations of economists and statisticians.

Furthermore, even in the 1920s, Wickens was not alone attempting to estimate the stock of human capital at the national level. Woods and Metzger (1927) provided several alternative sets of estimates for the United States in 1920; and Dublin (1928: 6), despite deducting the present value of future consumption expenditures from the present value of future earnings, still managed to arrive at an

estimate of the 'vital capital' of the United States in 1922 that was about five times its estimated material wealth.

Conclusion

Charles Wickens was a pioneer of human capital estimation in Australia. His contribution was preceded by only the broad-brush and much less sophisticated efforts of Johnston. In this context, it deserves a more generous acknowledgment than that accorded to it by Goodwin. In a wider international context, however, Wickens was a relative latecomer among the early valuers of human capital stocks. His skilled and imaginative approach entitles him to occupy a distinguished place in this group, though the degree of distinction is not as great as perhaps some may infer from Castles's accolade.

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Notes

1. Wickens's figures for the total male and female populations at 30 June 1915 were official Commonwealth Bureau of Census and Statistics estimates. He distributed these totals among his broad age-groups '[o]n the basis of the results of the census of 1911' (Wickens 1924: 553). His estimates of median ages were also derived from the 1911 census.
2. Both the private and public components of the total physical capital stock were estimated by the inventory method, with Knibbs's estimate of the private component covering 'all material private wealth existing in Australia, whether owned by persons domiciled in Australia or by those resident abroad' (Knibbs 1918: 136). (Knibbs also presented two other estimates of non-human private sector wealth for 30 June 1915, one prepared by the probate method and one derived from the results of the 1915 War Census. Neither, however, was a conceptually appropriate measure of the privately owned physical capital stock within Australia because each included financial assets, such as government securities, that were not claims on local privately owned physical assets.)
3. See also Groenewegen and McFarlane (1990: 100-102).
4. Later in the same paper, Johnston (1918: 6) presented an alternative, lower estimate of £164,060,000 for the capital value of 'Human Instruments', derived by capitalising a lower annual income figure. Although he did not account for the difference, it may have reflected an attempt to exclude property income (the income of 'the capitalist group') from the total income of breadwinners. See Johnston (1904: 15).
5. Other earlier attempts to estimate the cost of rearing a child are discussed in Kiker (1966: 482-3).

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