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CAPITAL FORMATION STATISTICS: PROBLEMS AND METHODS WITH SPECIAL REFERENCE TO UNDER-DEVELOPED COUNTRIES

(Memorandum by the Secretary-General)

I. Introduction

1. The present paper has been prepared in connexion with resolution 12(IX) of the ninth session of the Statistical Commission which requested the Secretary-General:

(1) To continue to collect information on the experiences obtained by the Governments of Member States in applying the standard definitions and classifications of capital formation, and to formulate proposals for revising the report Concepts and Definitions of Capital Formation;

(2) To continue to collect information on methods of estimation and to prepare a programme for the collection and presentation of statistics of capital formation and of capital consumption, giving particular attention to the needs of under-developed countries;

(3) To submit a report on the subject to the Commission at its tenth session.

As regards paragraph 1 of the resolution, the Statistical Office has collected a very considerable body of information on concepts, methods and procedures used by countries in estimating capital formation, especially in connexion with the periodic compilation of Statistics of National Income and Expenditure (Statistical Papers, Series H). Proposals for revising the report Concepts and Definitions of Capital Formation (Studies in Methods, Series F, No. 3) have been incorporated in a separate paper on modifications and amendments of the United Nations system of national accounts for consideration at the present session of the Commission.

2. With reference to paragraph 2 of the resolution, a careful appraisal of the materials of many countries indicates that the stage has not yet been reached in most countries to warrant the formulation of a standard programme for the collection and presentation of statistics of capital formation and capital consumption. Even for the statistically advanced countries the establishment of a common programme has encountered difficulties.[1/] This observation applies with special force to the estimation of capital consumption.

3. On the other hand, a review of the materials on capital formation supports and underlines the views expressed by the Commission at its ninth session that countries should concentrate their efforts on the improvement of basic data and methods of estimation in this field as a prerequisite to the preparation of more reliable and comparable estimates. The Commission noted that the under-developed countries in particular needed guidance and assistance because the practical and conceptual difficulties in the way of their preparing satisfactory estimates often appeared to be formidable. These problems stem not only from the more elementary stage of statistical development reached in these countries, but from the economic structure and the characteristic organization of economic activities within them. In particular, the dominant role of agriculture, the relatively large number of small scale producers in industry and the large volume of non-monetary activities all create difficulties.

4. In accordance with the Commission's request that major emphasis be given to assisting countries, and in particular under-developed countries, in developing better sources and methods in this field, it is the purpose of this paper to explore some of the problems encountered in the actual process of preparing estimates in the less developed countries, and incidentally to assess the methods and procedures being used. The paper does not deal with capital formation concepts as such except as they may be relevant to this purpose, nor

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1/ See for example the Reports of the Fourth and Fifth Plenary Sessions of the Conference of European Statisticians (Conf. Eur. Stats/61 and /80 respectively) and those of its Working Group on Statistics of Fixed Capital Formation.

does it attempt to survey estimating methods in general, these topics have been covered in various Statistical Office publications and in earlier reports prepared for the Statistical Commission.[2/] The concept of capital formation at the basis of the discussion is gross domestic fixed capital formation, i.e. no attempt is made to deal with depreciation allowances or changes in stocks. These subjects have been discussed in the publication Methods of National Income Estimation and in memoranda for the Statistical Commission and the Conference of European Statisticians, and it is doubtful, considering the statistical requirements for satisfactory estimates of these elements, whether any particular purpose would be served by their further examination in the present context. The problems of estimating capital formation in primitive (as distinct from under-developed) territories is not considered in this paper because the statistical difficulties are not special to capital formation but are part of the larger problem of obtaining any statistics at all for such areas, in which the mainly non-monetary character of the economy is only one of the many complications. A separate paper on this subject has been prepared for consideration by the Commission (E/CN.3/232).

5. A survey of the methods employed by countries for the estimation of capital formation indicates that two methods are widely followed: the expenditure method and the production or commodity-flow method. These methods have been described at length elsewhere and it will only be necessary to indicate briefly here the general lines followed in applying these distinct techniques. The expenditure method involves the collection of data relating to capital outlays from the purchasers of these goods. The required data may be assembled in various ways, e.g. by special inquiries, usually employing mail questionnaires, questions on such expenditures included in industrial censuses and analysis of taxation data. Opposed to this approach from the demand side there is the approach from the supply side which emphasizes statistics of

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2/ See e.g., A System of National Accounts and Supporting Tables (Series F, No. 2), Concepts and Definitions of Capital Formation (Series F, No. 3), Methods of National Income Estimation (Series F, No. 8) and "Statistics of Capital Formation", document E/CN.3/207 (presented to the ninth session of the Statistical Commission).

production, exports and imports. As has often been observed, while the expenditure method facilitates the classification of aggregate investment by industry or sector of use, the resulting estimates are apt to be influenced by the business accounting conventions underlying the figures collected from firms (e.g. in regard to the division between current and capital outlays). Reliance on the commodity-flow method permits the statistician greater freedom in defining terms and concepts but makes the classification by destination more difficult and involves a rather more elaborate analysis and synthesis of data, as will be made clear later.

6. In practice no country finds it possible to adhere consistently to a single method. Countries relying mainly on the expenditure method find it necessary to employ other techniques for unsurveyed firms and industries, for public bodies and for residential construction, to name only the major areas likely to require special attention. Similarly, where manufacturing and trade statistics form the backbone of the estimates, construction of all types remains to be handled in other ways. Even under the most favourable circumstances, then, the process of arriving at a measure of aggregate domestic investment (let alone the various types of classifications required for interpretation and analysis) is an involved one and calls for ingenuity and considerable skill in manipulating large and for the most part imperfect bodies of economic data. Indeed, the complexity of the operation is such that wherever statistical resources permit it would seem to be highly desirable to follow alternative and independent approaches to help in checking the global estimates of fixed capital formation and perhaps, some of its components. Such procedure would have the added advantage of facilitating the compilation of tables showing the composition of capital formation along the lines of table VI of A system of National Accounts and Supporting Tables, i.e. by type of capital good and by industrial use; for many purposes a cross-tabulation showing the main types of capital goods acquired by at least the leading industrial sectors to permit evaluation of the character and productive potential of new capital would be particularly valuable.

7. Under-developed countries for the most part follow the production method, or rather a variant in which production data play a role subservient to trade

data. Countries still at an early stage of industrialization typically import the bulk of their equipment; and since trade statistics are among the most reliable data available in these countries, the use of import statistics to estimate investment is to be expected. A second reason is that the expenditure method is more easily applied where a relatively small number of very large firms dominate the leading industries; this is not likely to be the case in the less industrialized countries (except occasionally in certain sectors, e.g. in mining) because of the important role played by small-scale producers and traders.

II. Application of the production method in under-developed countries: the use of import statistics

8. The use of import statistics for present purposes is, however, far from simple as further examination of the method will make clear. The first major step in the process consists in separating capital goods in the trade classification from consumers' goods and goods entering into further production (immediate goods), but before this process of allocation can begin it is necessary to have a serviceable criterion for identifying capital goods. While in principle all durable producers' goods with an expected lifetime exceeding one year qualify for inclusion, in practice it may prove expedient to exclude certain minor categories, although it is doubtful whether many such omissions need be made where estimates are based on import statistics.3/

The treatment of imported parts for repairs and maintenance and components of new capital goods.

9. Still another and more troublesome question of definition arises at this point, viz. the extent to which expenditures by firms on repairs and maintenance are part of capital formation. The point of view advanced in A System of National Accounts and Supporting Tables is that where such outlays do more than merely keep capital goods in a state of constant repair, i.e. where they extend

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3/ Comprehensiveness in this respect is more difficult to achieve where the expenditure method is followed because many minor items are regularly charged to current expense in business accounting.

the lifetime of an asset or improve its productivity, to the extent to which they do so they should be capitalized. A broader definition of capital formation is the Scandinavian one which includes all repairs and maintenance except daily upkeep. The choice of concept has a bearing on the list of imported capital goods to be drawn up since a decision must be made in regard to replacement parts. It will be seen that the United Nations definition is difficult to apply where the production method is followed for ordinarily there is no way of knowing just how purchasers will use imported parts (it may of course be possible to identify certain parts as destined for use in major repairs or reconstruction). If, on the other hand, the Scandinavian concept is accepted, practically all parts may be included on the assumption that daily maintenance, the only current expense admitted, involves mainly labour rather than parts. Statistical convenience is a point in favour of the Scandinavian concept but the fact that it is at variance with commercial accounting precepts and normal business notions of investment tells against it. Most countries, as a matter of fact, appear to regard only outlays for major alterations and renewals as capital expenditure and charge the balance of repairs and maintenance to current expense, a procedure conforming much more closely to the United Nations recommendation than to Scandinavian practice. Countries which favour the concept of capital formation as including all repairs and maintenance might consider providing an estimate of current repairs and maintenance (based perhaps on taxation records) so that gross capital formation in the generally accepted sense of the term would be available for purposes of international comparison. This issue is under consideration by the Conference of European Statisticians. Whatever position in this regard countries relying principally on import statistics choose to take, the selection of items for inclusion should be governed by a working rule as consistent as possible with the underlying definition. Where trade statistics are so organized that lists including and excluding doubtful items can be prepared to show how important the borderline cases actually are in the total, such lists may be most helpful in placing the problem in proper perspective.

10. One other problem is likely to arise as regards imported parts. In addition to being used as replacements, parts may be intended as components of capital goods assembled within the country. Certain countries which do not produce

motor cars and trucks, for example, do assemble these vehicles from imported components. When the value of capital goods produced (or assembled) in the country is estimated at a later stage, duplication will occur if the component parts have been included in the list of imported capital goods: not only components of machinery and equipment but building materials and supplies are here involved. There is, in fact, good reason to suspect that a fair amount of duplication of just this sort does take place.

11. While the record of assembly parts in import statistics is a complicating factor in this context, it may prove helpful in other connexions: for example, in evaluating or extrapolating production consisting mainly of the assembling of such parts into a finished product or the incorporation of imported building materials in construction. Where there exists no possibility of measuring directly such domestic production, imports of components must actually be the starting point for the estimate of home-produced capital goods.

The allocation of commodities with multiple uses or of mixed groups of commodities.

12. Once the principles for identifying capital goods in imports have been made explicit, the remaining problems in the way of establishing the lists are of a practical sort and involve the allocation of commodities with multiple uses or of mixed groups of commodities. Thus, many durable goods (e.g. motor cars) are purchased both by producers and households; others are at one and the same time finished capital goods and intermediate goods (parts), of which the latter may or may not belong in the list depending on the use to which the parts will be put and the adopted treatment of repairs in capital formation; a few durable goods even fall into all three categories, i.e. they are producers', consumers' and intermediate goods. While in practice commodities belonging predominantly in one class are usually classified accordingly in their entirety, country practices seem to differ markedly as regards the mixed groups. Some countries, for example, include certain of these groups wholly in capital formation and exclude the rest without attempting to split up any individual group. Other countries attempt to divide up a few groups while treating other mixed groups as completely in or out of capital formation. A few appear to analyze a comparatively large number of mixed groups and treat a smaller number as either

fully in or out of capital formation.[4] The question therefore arises whether the difference in the degree of refinement with which imports are analyzed can influence the end results significantly. Of course the nature of a country's imports and the degree of detail of its trade classification have a bearing on the effort that need go into such analysis, but a review of country practices suggests that these factors do not play a deciding role in accounting for the differences.

13. Considering in the first place that many mixed commodity groups have only a small value and that a firm statistical basis for determining the percentage to be allocated to investment seldom exists, particularly in the statistically less developed countries, a thoroughgoing analysis of all trade groups that include commodities that might be capital goods would not be justified. A more reasonable procedure, and no doubt one which is followed by many countries is to analyze carefully only important categories and to allocate other mixed groups or items, especially those of small value, in some rough but reasonable fashion. In some under-developed countries it may well be the case that only passenger cars and perhaps one or two other commodity groups really merit careful attention.

14. Some notion of the general importance of commodity groups requiring allocation (i.e. only in part producers' durable goods) can be obtained by inspection of the list of expenditures of the main supplier of capital goods, the United States. In 1955 the total value of United States exports of machinery and transport equipment (corresponding to Section 7 of the Standard International Trade Classification) amounted to about $5,400 million. Leaving aside for the moment the treatment of parts, the value of which is included in this figure, the total except for a minute fraction (batteries, etc.) refers to durable goods by any definition. Of this amount passenger cars accounted for $394 million and parts for cars (including such major parts as bodies, chassis and frames) came to $447 million. By comparison, other finished durable goods under this heading that would require allocation by receiving countries are small. For example, exports of air conditioning and refrigerating equipment amounted to $82 million; and of this sum probably only a minor part was purchased for personal use. Portable electric tools and appliances exported were valued at $45 million.

4/ Cf. E/CN.3/207, table 4.

Since electric fans, vacuum cleaners and the like are included here, part of the item is allocable to consumers. The same is true of some part of the exports of office machinery, the total for which was $108 million. Sewing machines, radio receivers and a few other durable goods which are bought by both business and consumers would also need to be split up on some basis, but again the amounts involved appear to be very small by comparison with motor cars. (While machinery and transport equipment accounts for the preponderant part of capital equipment, of course items under other section headings have also to be taken into account in forming a comprehensive list).

15. In short, countries basing estimates on import statistics will find that in terms of value the list of commodities corresponding to Section 7 of the SITC constitutes the bulk of investment in imported equipment, and that passenger cars may be by far the largest item in this or any other section requiring careful study. This conclusion is confirmed by inspection of the import statistics of a number of under-developed countries.

16. The figures just cited do not throw much light on the importance of parts other than parts for cars (parts are not generally shown separately where the SITC is followed).[5/] Where countries use trade classifications sufficiently detailed to distinguish parts from complete capital goods, experimentation with the figures may well lead to the conclusion that detailed analysis is not called for except for car parts and possibly a few other types. In any case, the division of parts into current and capital will have to be quite arbitrary (unless the Scandinavian concept is followed, in which case only parts that may be purchased by consumers need be of concern). If important assembly parts can be recognized (or traced from import documents or other sources) of course these should be eliminated. Parts that can be identified as having an expected lifetime under the admissible minimum can readily enough be excluded; but where various kinds of parts are lumped together (e.g. as generator parts) the guiding definition will usually furnish only a target and not an operational formula, except where the bulk of the parts may reasonably be considered the kind used in major repair work and a working rule of this kind is followed.

5/ Statistics of exports of important parts are actually available in the original United States classification.

17. Fortunately, a reasonably satisfactory basis for distinguishing the fraction of passenger car imports destined for business use, and therefore to be included in capital formation, does exist in most countries. Commonly car registration statistics provide the main evidence for such an allocation. In countries controlling or limiting motor car imports, import licenses may furnish the basis. Very few countries seem to go so far as to allocate expenditures for individual cars used partly for business and partly for personal use; in other words, the main purpose to which the car is put determined how it is classified. However, some cases are known in which such allocations are attempted in the agricultural sector. As regards car parts, the percentage applied to complete cars could, at least as a first approximation, be applied also to car parts after first eliminating whatever fraction of total car parts is deemed to be for current upkeep or the assembling of new cars within the country.

18. As mentioned above, Section 7 of the SITC (machinery and transport equipment) includes the bulk of capital goods recorded in international trade statistics. In addition, various other goods classified elsewhere must be included. To assist countries in identifying commodities to be taken into account, such a list of goods has been prepared for the Working Group on Statistics of Capital Formation set up by the Conference of European Statisticians.[6/] The list is drawn up on the basis of the SITC and is arranged in two parts: goods which are or may be complete capital goods and replacement parts. Durable goods which are acquired by enterprises only to a minor extent (durable consumers' goods) are excluded, since otherwise the list would be simply a list of durable goods. A one year life is taken as the criterion of durability and for convenience the list includes all parts lasting a year or more.

19. A list of "replacement parts" can also largely be regarded as a list of materials for the home production of new capital goods. If a country has a comprehensive annual census of manufacturing, little or no recourse need be had to import statistics of such parts, since to the extent to which they are parts of new capital goods or of major alterations they will be included in the statistics of home-produced capital goods, while if they are replacement parts they must in the main be deemed to be current costs. If a country does not have an annual

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6/ Document Conf. Eur.Stats/WG.5 CF.2.

census, and this will in general be the case with the less industrialized countries, the list should be useful in connexion with the estimation, as at factory or works, of home production of capital goods ready for use. If a country has censuses at intervals of years, such an estimate might be made by multiplying the factory value at the last census of the relevant finished goods by the ratio of the value of current imports of parts to the corresponding value in the census year. If the country has had no recent census, the current estimate may be prepared from data supplied by a few leading manufacturers of capital equipment giving the ratio of value of output to value of imports of parts. Of course, equal care should be exercised in the estimation of the distribution mark-ups of home-produced capital goods as in the case of such goods imported (see below).

III. The estimation of trade mark-ups, transport charges, etc.

20. Since the full value (or cost) of fixed assets actually in place is the proper measure of capital formation, the next major step consists in adding to producers' durable equipment the trade mark-ups, transportation costs, and other expenses entering into the final cost of the assets to the ultimate purchaser. These various charges taken together are normally large compared with the recorded c.i.f. value of the assets arriving at the shores of a country, and they therefore influence the reliability of the final estimates of capital formation to a significant degree.

21. The cost of an installed asset to a firm will exceed the recorded import value by an amount corresponding to the middleman's mark-up, transportation costs within the country, installation costs, legal and engineering fees, customs and any other payments involved in acquiring or installing the asset. These charges expressed as a percentage of the value of imports will of course vary not only from one country to another, but from one class of assets to another. Thus, as between countries, trade practices, etc. will influence the trade mark-ups, transportation costs will depend on the size of the country, the nature of the transportation facilities available to move equipment, and so on. For a given country, these charges will vary as between the different classes of equipment depending on the trade channels customarily used, the bulkiness of the goods to be moved, and other factors. It is not surprising, therefore,

that the overall percentage mark-up covering all charges varies so widely from country to country: from under 10 per cent to 50 per cent or more. What one would expect, however, is the widespread practice of applying a uniform percentage mark-up to imported capital goods. Indeed from all indications the percentage by which imports are raised is determined in a fairly arbitrary fashion in many cases, so that the wide variations among countries may very well reflect simply differences in practice rather than actual differences in cost structure.

22. In the more developed countries trade mark-ups and transport charges are based on censuses of trade or distribution, records of price control or rationing agencies, the advice of trade specialists, etc. Even in these countries trade mark-ups and transport charges are normally estimated together, since in many cases separation of such services would be artificial (as when the importer or wholesaler includes the cost of delivery in his price) and since in any case the objective is to account for the total of charges. Very few countries actually take into consideration other charges such as installation costs and engineering fees, and almost all of these rely on the expenditure method and cover additional costs of this kind only to the extent that they are capitalized by firms.

23. A firm, broad basis for raising import costs to the level of expenditures incurred by final purchasers of capital goods is lacking in nearly all of the less developed countries (as well as in many highly developed countries with much more comprehensive statistics). Nevertheless, considering that the final estimates of capital formation are influenced so much more by the percentage by which imports are raised than by, say, the inclusion or exclusion of minor capital goods or even possible differences in concept, the crude adjustment applied by many countries appears to be a glaring weakness in procedure.

24. For certain important classes of capital goods special sources of information on capital good mark-ups are often available in under-developed countries, sources which are not always exploited as fully as they might be or even go untapped. Agricultural credit agencies, for example, frequently make loans to farmers for specific purchases of farm machinery and are informed as to prices and types. By relating import prices to farmers' buying prices

for even a small number of leading items (tractors, etc.), a satisfactory basis for dealing with imports of agricultural equipment can be readily established. As to industrial (as well as farm) machinery, wholesalers' or importers' list prices or similar sources of information should furnish a basis for items passing through these channels; certainly final prices for cars and trucks sold by authorized dealers are obtainable everywhere. Limited surveys to determine the mark-ups used by a few of the leading firms specializing in imported equipment (perhaps in conjunction with the collection of selling prices for important selected items) would be another way to collect needed information.

25. Expensive major items such as large ships, locomotives, aircraft and large power generators are imported directly by the firms that will use them, the equipment often being built to specifications. Where imports of this kind are important, direct inquiries should be made of the purchasers unless the reports of public authorities, railroads and other buyers furnish the data. In any case it would be misleading to apply comparable percentage mark-ups to these imports for which domestic transport costs and import duties, if any, account for virtually the whole difference between the c.i.f. value and the final cost to the buyer. One or two of the countries using rather arbitrary mark-ups do as a matter of fact apply different percentages depending on how the goods are acquired. While this is an improvement over a uniform mark-up on all imports, the division of imports into direct purchases by final users and purchasers through importers appears to be very rough. (As an example, one country raises two-thirds of the c.i.f. value by 20 per cent and one-third by 70 per cent to obtain, respectively, the final cost of directly imported capital goods and capital goods imported for resale.)

IV. The estimation of domestically produced equipment

26. The estimates of investment in machinery and equipment imported from abroad must of course be supplemented by estimates of such capital goods produced within the country. Usually a census of industrial production or manufacturing is the basis for estimating the home-produced component of equipment. More than sixty countries now carry out such censuses and although the objectives of

industrial census programmes differ the production of capital goods can almost always be derived. While many countries take annual censuses, most carry out their censuses at intervals of five or ten years. These complete censuses are coming more and more to be supplemented by abbreviated annual surveys or sample inquiries designed to provide information for non-census years, or for small establishments, or in greater detail on special aspects. Consequently, estimates of the production of machinery and equipment can as a rule be reasonably well grounded. The existence of a very large number of small businesses which defy enumeration, so typical of under-developed countries, creates no important problem here since such enterprises seldom engage in the production of producers' durable equipment (and of those that do, minor repair work of the kind often excluded from capital formation may be an important feature).

27. In theory, an adjustment is required for changes in the stocks of capital goods, imported and locally manufactured, held by producers and in trade channels, since where net additions to stocks take place fixed investment is diminished accordingly, and vice versa. Considering the difficulty of isolating the amounts involved and the relative unimportance of this factor in most countries in normal times, it is hardly suprising that very few countries actually make specific allowances for such stock variations. Where it is known that changes in stocks of capital goods are appreciable, the adjustment may be based on such sources as trade census materials, inventory and sales data reported to taxation authorities, special stock surveys, studies of ratios of inventories to cost of goods sold and correspondence with trade associations. As regards exports of capital goods, which must be of course deducted, no serious statistical problem is encountered. For the least industrialized countries, however, the amount involved is negligible and therefore also disregarded.

28. Where production statistics are not compiled annually (or more frequently) the preparation of estimates for non-census years is a more serious practical problem. Usually relationships between the production of producers' durable goods and indicators of business activity are used, e.g. sales on a commodity or industry basis, or payroll data. In countries where the production of machinery and equipment consists largely of the assembling of new capital goods from

imported parts, the record of such imports in the trade statistics furnishes a ready and reliable guide for extrapolation, if not for the actual checking of production data.

29. The problem of raising production valued at factory prices to the required final cost level is identical with that encountered in revaluing imports, and the methods described in that connexion apply here as well.

V. Buildings and other construction and works: estimating problems

30. Countries following the commodity-flow method in estimating investment in machinery and equipment are only rarely able to employ censuses of the construction industry or sample returns from building contractors for estimating investment in construction, either because the industrial census programmes do not extend to this industry or because the data collected are not suited to the purpose. In at least one country which takes a census of the building industry annually, small firms are covered only on a sampling basis. Construction work accounted for by the sample is then raised to a level representing the gross output of all small firms in the industry (by using the factor of employment) and this total is considered to be in the nature of current repairs and maintenance, i.e., not capital formation. Of the work done by larger concerns all but a small part is regarded as comprising gross investment. Separate schedules are used for public undertakings, railways, etc. to obtain particulars of the construction work carried out by their own employees.

31. The method most often employed centres around the use of building permits. Such permits are now required for most types of construction work in a great many countries, and although the information required of prospective builders differs it is almost always possible to infer from these records the value of construction to be undertaken. Usually the cost of the work is specified; where cost is not stated some indication of the size of the structure is given, e.g., in square feet or cubic yards. In the latter case it is usually possible to estimate the value of the completed work by applying an appropriate average of costs (e.g., per square foot), or different averages depending on the nature of the construction, region of the country, and so on.

32. Not infrequently licences to build or permits are issued only in certain regions, in urban centres, or in localities where compliance with local laws is required; or, instead of formal permits, local records of one sort or another may be kept by town or village officials. Where this is the situation the first step in preparing an estimate is the collection of the scattered information by questionnaires addressed to a representative sample of the local officials. Construction on a national basis can then be estimated in various ways, e.g., by determining from the sample the value of construction per capita for cities, towns, villages, etc. of different size and distributing the total population according to size (number of inhabitants) of city, town, etc.

33. Field studies carried out in certain countries demonstrate that the actual costs of construction do not always agree closely with the cost estimates shown in individual building permits. In addition, of course, a certain amount of unlicensed building almost invariably takes place, varying periods of time elapse before the actual start of work, permits may be allowed to lapse altogether, rates of construction vary and so on. These complicating factors are sometimes ignored in using permit valuations, but several countries attempt to allow for their influence, separately or in combination. It is possible, for example, to apply a correction factor based on follow-up studies to the cost estimates given in building permits in order to improve agreement with actual final costs. Allowances for incomplete data or unauthorized building in permit-issuing localities may also be determined by field investigations. In one instance where errors of this sort were investigated it was found necessary to add 20 per cent to the total of recorded cost estimates. To relate the value of actual construction carried out in successive months to the value of building permits issued, an average building period may be determined or progress inspections may be made. One country has established typical activity patterns for various types and sizes of projects based on its experience over a long period of time.

34. For estimating construction activity not likely to be covered by permits or licences other sources must of course be used. For example, permits may be required only for residential construction or for private construction of all

kinds costing more than a specified amount. In any event, part or all of the construction paid for by Government will have to be based on other sources. Where a census of the construction industry has been used, building work undertaken on behalf of Government will be accounted for and only work done by public employees needs to be added. In the more usual case (reliance on permits), however, all government investment in construction will need to be added from separate sources. In many cases an analysis of the public accounts, published annual statements of public corporations, etc. will yield the desired information. The necessary budgetary information for local government as distinct from central government will often be fragmentary, however, as there is frequently no unified source for data on the expenditures of local authorities. In this case a sample of local government construction expenditures may have to be raised to the universe level by use of an appropriate factor, such as population. In other cases data for local government units may be available only at intervals of several years (e.g., decennially), posing the problem of projection. Direct returns of capital expenditures from central government, local authorities (on a complete or a sample basis) and important public corporations provides another and generally very satisfactory basis for estimation, since the need for reclassification and adjustment of items - inevitably required in even the best of the consolidated statements compiled mainly for administrative purposes - is thus avoided.

35. A completely different approach to the measurement of investment in construction is found in some countries, an approach that has obvious attractions for under-developed countries importing most of their building materials, but used also in more developed countries. This method consists in tying the estimates for construction to the value of building materials used up. In the most primitive application of the method the value of a small number of imports of basic building materials and supplies is simply multiplied by some factor to yield a rough estimate of the full value of construction work performed. In one case the estimate is based on imports of cement alone on the assumption that cement accounts for one-sixth of the value of construction. In another case three times the value of total imports of building materials is used.

36. More meticulous estimates start with the value of building materials produced and imported and add other leading cost elements, such as transportation charges, mark-ups on materials, wages paid in the building trades and profits of builders. On occasion, some allowance is made for repair and maintenance work of a current nature in the form of a round percentage deduction from the total.

37. The reliability of estimates based on this general approach will obviously vary very widely depending on the care taken to account for all the elements of cost entering into the final value of construction laid down, and on the quality of the statistics available for measuring these component costs. The simple procedure of multiplying materials expenses by a single coefficient is difficult to justify unless cost studies actually indicate a persistent relationship. The even more streamlined procedure of applying a coefficient to one or a small number of imports would seem to be still less defensible, since other imports, locally produced materials (e.g. lumber) and labour costs taken together form so large a part of total cost. Indeed, many types of construction work in under-developed countries have no materials content whatsoever (land reclamation, irrigation ditches), or else require only simple native materials (huts and farm structures of bamboo or mud). Imports of building materials and supplies can, however, facilitate extrapolation of benchmark estimates prepared on some other basis, especially of those components incorporating imported materials to a significant extent. Another source of error is changes in stocks of imported materials.

VI. The problem of own-account construction

38. Whether the basic estimating method depends on a census of the building industry, building permits and other records, or statistics of building supplies, the coverage of own-account construction, i.e. assets produced by enterprises for their own use, will in all likelihood be only partial (and even under the best of circumstances less satisfactory than where the expenditure method can be consistently followed). It is doubtful, however, that this partial omission is very serious in these countries except in the agricultural sector, where capital improvements made by farmers may amount to a sizeable total. The particulars for the non-agricultural sectors can be obtained as part of an industrial production inquiry: own-account construction in distribution and other non-agricultural

sectors is likely to be negligible. It may be noted, incidentally, that even in those developed countries making use of the expenditure method, capital expenditures by farmers will as a rule be measured by other means. Omission of capital improvements to farms carried out by farmers is therefore equally likely here; but of course the consequences of ignoring such investment will be less serious.

39. Improvements carried out by farmers themselves take many forms: the construction of barns, sheds, fences and roads; the digging of wells and irrigation ditches; the planting of orchards; the reclamation, drainage and terracing of lands; etc. It is doubtful whether the bulk of investments of this sort can be ignored in agricultural countries without limiting unduly the usefulness of capital formation totals. Nevertheless, many such countries do neglect own-account construction in agriculture, either because of the emphasis on industrialization and therefore on capital accumulation in industry as distinct from agriculture or because of statistical difficulties.

40. So far as statistical problems are concerned, not only the identification of these own-account projects but the very basis for valuing them gives rise to difficulties. The valuation problem is of particular interest because at least three distinct valuation bases are possible, all leading to quite different results. One method would be to value such assets with reference to the cost of comparable assets constructed commercially. Another basis would be to use the cost of materials and paid labour. Still another possibility is to include in labour cost an imputed amount to cover the services of unpaid workers, such as members of the farmer's family. Of these alternatives the first leads to the fullest valuation, the second to the most restricted. The third method yields a result smaller than that obtained by the first method since profit margins and certain overhead costs covered by charges of contract builders are excluded.

41. The second method, i.e. valuation at actual costs incurred, is the one favoured in a System of National Accounts and Supporting Tables because imputations are thereby altogether avoided. This principle of valuation should also be applicable to community projects using voluntary labour, as in the construction of village roads, etc. It will be noted that the exclusion of

unpaid labour and profit margins will here lead in most cases to small or even zero values for durable improvements. This of course is equally true of those farm improvements carried out wholly or largely with unpaid labour and simple materials freely at hand. In the circumstances, it is understandable that a more comprehensive basis of valuation may be considered more suitable by certain countries. Specially troublesome is the problem of valuation of family labour in own-account farm construction. Perhaps the best solution would be to value this at recognized rates for paid labour in the neighbourhood. No doubt this whole problem, which assumes significant proportions mainly in the under-developed countries (in one predominantly agricultural country own-account farm improvements alone amounted to about 13 per cent of contract construction valued roughly according to the third method described above), will require further consideration when more experience has been accumulated. It would be well in countries in which such construction is a sizeable fraction of all capital formation, to distinguish it as a separate heading in the statistics of capital formation.

42. Of the countries that do purport to cover own-account construction in their estimates of capital formation, most appear to use rough and ready methods that make it difficult to determine what the principle of measurement is supposed to be. (As an example: when building materials purchased by farmers as reported in a census plus one-third for labour costs are used to estimate all non-residential construction on farms, the extent to which the improvements made by farmers directly are covered and the principle of valuation are left obscure.) In a few cases, however, careful attempts are made to cover consistently all such activity. Thus, in one country where a national farm survey is taken each year, the accounts kept on each of the sample farms include a record of the materials purchased for capital purposes and the cost of labour engaged in capital work, thereby providing precisely the data required for evaluating these assets by the second method. Where own-account construction on farms is known to be significant, the inclusion of such questions in agricultural surveys is probably the best way to collect the data needed for an estimate; and agricultural sample surveys are a statistical sine qua non in under-developed countries.

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VII. Summary and conclusions

43. For convenience, the salient points made in the paper are summarized below:

(a) Import statistics constitute the backbone of capital formation estimates of under-developed countries (para. 7).

(b) Although the use of import statistics introduces the problem of allocating parts for use in repairs and maintenance, major alterations and assembly of home-produced capital goods, also of allocating durable goods with multiple uses (producers', consumers', intermediate goods), the relative smallness of most of the values involved suggests that detailed allocation of the individual items is not warranted. Analysis should rather be confined to a few major items, such as cars and car parts (paras. 9-18).

(c) Where no direct measures of domestic production of equipment are available, import statistics of parts for domestic assembly should be the starting point in such estimates (para. 11).

(d) Very considerable improvement in the estimates of capital formation may be expected by the use of often untapped sources in estimating trade mark-ups and transport charges. The uniform percentage mark-up, so frequently used, is subject to a considerable margin of error (paras. 21-25).

(e) Various techniques are used in estimating building and construction. One method, which consists of valuing the building materials produced and imported plus other important cost elements appears to be particularly suitable for under-developed countries where the more conventional types of data are lacking (paras. 30-36).

(f) Although own-account construction in the agricultural sector is particularly important in under-developed economies, estimates of this activity are generally very weak and often even omitted. Several techniques for measuring this item are described (paras. 38-42).

44. Reference has been made to the principal sources of information on fixed capital formation, which are as follows:

(i) Import statistics in the two categories (a) ready for use,
(b) materials for capital goods;

(ii) Agricultural surveys;
(iii) Statistics of industrial production (including construction);
(iv) Central and local government statistics, including taxation records;
(v) Building permits and the like;
(vi) Statistics of prices (for estimating mark-ups, etc.);
(vii) Car registrations.

Sources (i)(a), (ii), (iii), (iv), and (vi) pertain to direct estimation, the others to indirect estimation. If available, all sources should be utilized but most reliance should be reposed in direct methods, indirect methods being used mainly for (1) checking and elucidating direct estimates, (2) estimation of minor constituents. In this difficult field of statistical methodology the importance of establishing independent or quasi-independent checks cannot be over-emphasized.

45. Especially in less developed countries, large recourse to sampling methods will be necessary. For own-account construction in agriculture, so important a part of capital formation in many countries, it is the only conceivable method. In connexion with production statistics the method, fraction diminishing with size of establishment, with 100 per cent for the largest establishments, will generally be favoured, whether the estimates are made by the production or the expenditure method. Sampling will also be useful in estimation by indirect methods, for example for establishing the fraction value of building permits anticipated to actual, proportion of cars for business use to total car registrations, etc. Close attention to the problem of the grossing-up of sample data to obtain global estimates will be required. While due regard should be had to randomness and efficient design of samples, in many cases a fetish need not be made of these desiderata, for very often what is required is a proportion of one kind or another, for example percentage price mark-up of capital goods imported ready for use or home-produced, or value of own-account construction on farms as percentage of value of for example, rice produced. In such applications rigorous adherence to the tenets of random sampling, which is notoriously difficult in agricultural surveys in particular, is not necessary.

46. All elements in the estimates should be based on genuine inquiries, as little recourse as possible being had to guesses, however authoritative. It is not enough to estimate items deemed "principal", for it often happens that smaller items are very numerous and thus large in the aggregate.

47. There is no justification for a defeatist attitude on the part of less developed countries towards the problem of reasonably accurate estimation of gross fixed capital formation. Study of the methods used in these countries leaves one with the impression that with little extra effort the statistical quality of the estimates would be considerably improved. The problem is a formidable one in every country. In some respects its solution is easier in under-developed countries where the economies are less complex, more information can be derived from external trade statistics, and the proportion of home production of capital goods borne by a few large concerns is probably greater than in more developed countries. Even more important, under-developed countries now in process of compiling these statistics for the first time can learn much from the experience of statistically older countries. In the latter, statistics of capital formation, like all other statistics, grew in a somewhat haphazard way, sometimes as administrative by-products or, if included in purely statistical inquiries, not quite just what was required. Countries now about to set up statistics of capital formation are in a better position to judge what they want and how to get the necessary statistics. With a master plan and an improved realization of the fundamental importance of these statistics as an instrument for economic and social advance, they are more likely to secure the ready co-operation of central government departments, local government, larger concerns in particular and the business community in general than has been the experience of path-breakers in other countries.

48. As pointed out in paragraph 2, it is felt that proposals for a common programme for the collection and presentation of statistics of capital formation with emphasis on the needs of under-developed countries cannot realistically be made at the present time. The Statistical Commission may, however, wish the Secretary-General to follow developments, to continue to assess critically the methods and sources being used, and in general to assist countries in all ways

possible in the improvement of their statistics of capital formation. A report on the progress made could then be submitted to the eleventh session of the Commission as a basis for determining what future steps need to be taken to accelerate progress in this important and difficult area of national accounting.
