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The Labour Market and Production Boundary in CGE Models

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Abstract

The literature on the role of macroeconomic closure conditions in CGE is extensive whereas the analyses of the implications of different factor market clearing conditions is relatively sparse. This note addresses the interplay of different labour market clearing conditions by reference to the production boundary that all CGE models must, implicitly or explicitly, define. It is demonstrated that an appreciation of the interplay of labour market clearing conditions with the production boundary is important to understanding and interpreting the implications of different labour market clearing conditions.

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1. Introduction

Many of the CGE models currently employed for economic analysis and labour supply focus on the portion of a household's and/or individual's time in employment, with the implicit assumption that the supply of labour is fixed at this level. Traditionally this has been relaxed, in some analyses, by the assumption that there is a pool of surplus labour, in the spirit of Arthur Lewis (1954) and the associated Dual economy/sector models, that can be drawn upon according to the demand for labour of that type at zero marginal cost. In the former case the labour supply curves are assumed to be vertical, while in the latter case the labour supply curves are assumed to be horizontal. Regimes switching versions of these polar assumptions can, and are, implemented using MCP formulations of GAMS based CGE models.

Several models have relaxed these assumptions in one of two ways: (so-called) upward sloping labour supply curves and the modelling of labour-leisure trade-offs. Both alternative assumptions require that increases in wage rates are required to draw out additional supplies of labour.

A critical, and largely unacknowledged, aspect of labour markets in CGE models is the relationship between the labour market and the production boundary: all whole economy models must contain a production boundary, even if the boundary is not explicitly recognised. Crudely a production boundary defines those dimensions of micro economic[1] activity that are included in a CGE model; and those that are excluded. Complications arise if the model intentionally, or not, includes transfers across the production boundary. It transpires that factor market clearing conditions involve the potential for non-trivial transfers across the production boundary.

It is also worth noting that there is a long literature reporting estimates of the proportions of economic welfare accounted for by activities that are within and out with the production boundary (Hawrylyshyn, 1976; Poissonnier and Roy, 2015). For many developed countries the order of magnitude of these estimates suggest that activities out with the SNA

[1] CGE models are Walrasian and hence major dimensions of (macro) economic behaviour are not included, e.g., money and asset markets. The 'boundary' between the micro/Walrasian and macroeconomic dimensions has long been explicitly recognised and discussed in the literatures on macroeconomic closures and CGE models.

boundary account for about one third of GDP and an even higher share of the value of private consumption.

This note considers the interplay between factor market clearing conditions and the production boundary in whole economy models using examples that draw upon CGE models. The second section of the note provides a review of the concept of the production boundary. The review adopts the definition of the production boundary in the System of National Accounts (SNA); this is not an endorsement of the SNA's definition but simply a recognition of the reality that national accounts are, overwhelmingly, drawn up in accordance with the SNA's principles. The third section reviews four standard approaches to the clearing of labour/factor markets in CGE models and makes explicit the underlying assumptions and how the factor market clearing conditions interact with the production boundary. It transpires that only the assumption of full employment *within the production boundary* is neutral with respect to the production boundary, while other approaches involve transfers across the boundary. The fourth section draws conclusions about the appropriateness of the different factor market clearing conditions on the qualifications that should be attached to each of the options. The fifth section reviews interactions across the production boundary other than those associated with factor markets. The note closes with some suggestions about how CGE models may be developed to bridge some of the limitations imposed by the necessity of including a production boundary in all whole economy models.

2. Production Boundary

A production boundary is essential in all whole economy models since it defines which economic transactions are endogenous to the model and which are exogenous. It is widely acknowledged that even the most comprehensive of economic accounts and models do not encompass all transactions; the classic (undergraduate) discussion about the dimensions of economic transactions included in, or excluded from, measures of GDP/GNP are applications of the concept of a production boundary. The example of the production boundary applied to measured GDP/GNP, as recorded in national accounts, is directly relevant to all empirical whole economy models that are benchmarked against estimates of GDP/GNP; if the GDP/GNP recorded in the database is to be consistent with the estimate of GDP/GNP in the

national accounts then the measure of GDP/GNP in the whole economy model must be defined by reference to the same production boundary.

The decision about where to draw the production boundary is not only conceptually and theoretically tricky, it is also constrained by empirical concerns that seek to ensure consistency between the databases for whole economy models and national accounts.

In price driven whole economy models, e.g., CGE models, where the Law of One Price (LOOP) is typically presumed to hold[2] and each price is uniquely determined, it is reasonable to argue that production and consumption decisions relating to goods and services should only be deemed to take place within the production boundary if those goods and services can have uniquely determined prices. This is essentially the approached adopted by the SNA when it defines its production boundary.

Production and Consumption Boundaries

The definition of the production and consumption boundaries typically proceeds by defining those activities that are within the boundaries; activities outwith the boundaries are thereby defined as those activities that are not within the boundaries.

The SNA recognises a definition of the *general* production boundary (SNA, 2008, 6.24 and 6.25) that has economic meaning. This defines all activities using inputs (primary and intermediate) that are controlled and organised by institutions, which means that all natural/unmanaged production takes place out with the boundary (6.24). This definition is relatively straightforward for goods but rapidly become opaque for services. Services such as eating, exercising, sleeping etc., cannot be contract out, and are not productive in the economic sense, but services such as child care, cleaning etc., can be contracted out, and therefore fall within the *general* production boundary.

The SNA's definition of its production boundary is more restrictive. Activities that produce goods and services for sale on markets typically satisfy the SNA condition that the prices can be uniquely defined, whether or not they are actually sold. Consequently, home

[2] The discussion here abstracts from those circumstances where the LOOP may be violated for pragmatic reasons.

production for home consumption (HPHC) is within the production boundary (SNA, 2008, 1.41.and 1.42 and 6.27). But, excludes "activities undertaken by households that produce services for their own use …… except for services provided by owner-occupied dwellings and services produced by employing paid domestic staff"[3] (SNA, 2008, 1.40, 6.26 and 6.27). Purchases of goods and services used by households to produce 'services for their own use' are within the production boundary; therefore, the inputs that are used to produce 'services for their own use' that are excluded from the accounts are (overwhelmingly) labour.[4]

The decision to exclude most services is driven by the fact that "household services are not produced for the market, there are typically no suitable market prices that can be used to value such services." (see SNA, 2008, 6.28 to 6.31). Thus, goods produced by households for own use (HPHC) and some services are within the production boundary; an oddity is "services produced by employing paid domestic staff", but the logic is that domestic staff are in paid employment and therefore their activities contribute directly to measured GDP.

Production Boundary and Welfare

These definitions (general and SNA) of the production boundary ensure that absorption of goods and services produced within the production boundary and welfare differ; economic welfare must be greater than, or, exceptionally, equal to, absorption. All uses of labour time by households to produce services, either by the households or NPISH, consumed by the households are excluded from absorption. The SNA's asserts that "[T]he exclusion of these services from the production boundary is not a denial of the welfare properties of the services but a recognition that their inclusion would detract from rather than add to the usefulness of the SNA for the primary purposes for which it is designed, that is economic analysis, decision-taking and policymaking" (SNA, 2008, 1.78); it may be argued that the exclusion of these services inhibits economic analyses.

The measurement of welfare is complicated by the implications of external events, e.g., weather effects (hurricanes etc.,) and epidemics, and by externalities, e.g., emissions and other

[3] Contributions of time to NPISH are also excluded from the SNA production boundary (SNA, 2008, 1.40).
[4] It is conceivable that other non-produced inputs, i.e., 'land', are used to produce such services.

forms of pollution. In both cases it is possible that welfare will decline despite apparent increases in GDP (SNA, 2008, 1.79 to 1.82).

An important consequence of the distinction between absorption and welfare is that welfare depends, at least in part, on the use of labour time within the *general* production boundary but outwith the SNA production boundary. Consequently, if labour time is transferred from the production of services for own consumption to activities within the SNA production boundary, there will be positive and negative implications for welfare. Contributions to welfare from the own production of services will decline, if labour time outwith the SNA production boundary has a positive marginal product,[5] while the contributions to welfare from activities within the SNA production boundary will increase.[6]

The Production Boundary and the Measurement of Population and the Labour Force

The production boundary has implications for the measurement of the labour force and its relationship to the measured population. The measurement of a population may be a relatively straightforward recording/estimate of all persons in a country/region. The difficulties arise when seeking to assign individuals within a population to various categories, e.g., employed, unemployed, dependent children and adults, etc. This can be reduced to determining those persons in the labour force and those that are not at some point in time.

Those not in the labour force can be defined as those who are dependent children and adults, and therefore unable to work, and those who 'choose' not to work in a period, which includes those who 'choose' to be in education rather than the labour force.

At issue therefore is the definition of the labour force. An ILO resolution of 2008 "confirms that the economically active population is defined in terms of individuals willing to supply labour to undertake an activity included in the SNA production boundary" (SNA, 2008, 19.5). Thus, the labour force "consists of those who are actively prepared to make their

5 The possibility of negative marginal products of labour time is difficult to reconcile with economic theory, but the possibility that a lack of formal employment may have negative welfare implications cannot be lightly dismissed.

6 The definitions of welfare (equivalent variation – EV) thus need to be qualified as 'measured' welfare. If labour is transferred from own production of services to activities within the production boundary – called an endowment effect in the GTAP welfare decomposition – then the increase in 'measured' welfare will be an absolute upper bound BECAUSE the loss of welfare associated with own production of services has been ignored.

labour available during any particular reference period for producing goods and services that are included within the production boundary of the SNA. The labour force is further divided into those who are employed and those who are unemployed." (SNA, 2008, 19.17). The SNA provides definitions for employed persons who are categorised as 'employees' (19.20 to 19.24) and 'self-employed' (19.25 to 19.28). Those persons engaged in HPHC are classified as self-employed.[7]

The unemployed are defined as those who are neither "an employee or self-employed but available for work and actively seeking work." (SNA, 2008, 19.29) Moreover the SNA notes that "[T]he concept of unemployed persons is not required in the national accounts because the unemployed do not contribute to production but their numbers are necessary to make the conceptual transition from the employed population to the economically active population." (SNA, 2008, 19.29); NB: 'economically active' is defined by reference to the production boundary.

Thus, the population of the country can be subdivided into three categories; employed, unemployed and not in the labour force.

By defining the labour force based on the production boundary, the SNA conveniently sidesteps an arguably important consideration. Specifically, as the SNA notes, "[I]f the production boundary were extended to include the production of personal and domestic services by members of households for their own final consumption, all persons engaged in such activities would become self-employed, making unemployment virtually impossible by definition." (SNA, 2008, 1.42) While the SNA argues that "[T]his illustrates the need to confine the production boundary in the SNA and other related statistical systems to market activities or fairly close substitutes for market activities" (1.42), it does introduce a tension.

The definition of the *general* production boundary explicitly recognises that labour used outside the SNA production boundary can and does contribute to welfare. If such labour makes a positive contribution to welfare, i.e., it has a positive marginal product, then any

[7] The precise definitions are relevant when compiling databases on employment, but in the current context the critical feature is fact that the labour force is defined by reference to the SNA production boundary.

reduction is defined unemployment must also mean that the contribution of ‘services for own use’ to welfare must decline.

3. Labour Market in CGE Models

This discussion of the labour market in CGE models limits the discussion to the issues relating to the size of the employed labour force, i.e., labour supply, and characterises the modelling of labour markets in CGE models in a slightly stylized manner to ease presentation. The four stylized groups of treatments of labour supply considered are

a. fixed supply, i.e., full employment or no involuntary unemployment;
b. surplus labour,
c. labour supply curves, and
d. labour tradeoffs.

In each case the discussion is developed in the context of a production boundary that lies within the *general* production boundary; for ease of exposition it will be assumed that the relevant production boundary is the SNA boundary.

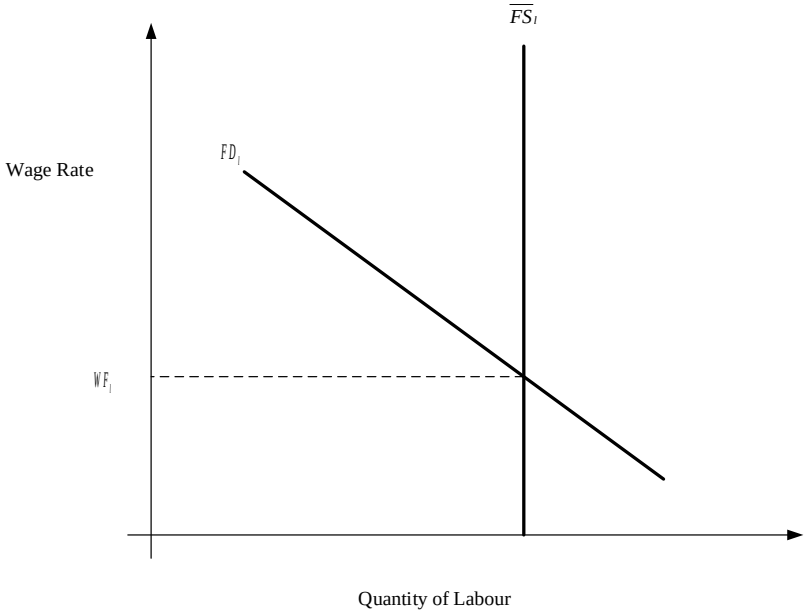
The discussion will focus on the implications of different assumptions about the operation of the labour market for welfare and the contribution to household welfare of the different allocations of labour.

The discussion further assumes that each type of labour is unique and unchanging, i.e., that there is no mobility between the different types of labour. The index l is used for each type of labour, the supply of labour is defined as FS_l, the demand for labour by activity a is $FD_{l,a}$, with the TOTAL demand the demand for labour (by all activities) is FD_l , the supply of labour by each institutions is denoted by $FSI_{l,h}$, the wage rate for factor l is WF_l,

Full Employment

The full employment assumption asserts that the labour supply curves are vertical, i.e., the supply is fixed - $\overline{FS}_l$, and, by implicit assumption, the labour supply by each household - $FSI_{l,h}$ – is fixed. This is illustrated in Figure 1.

Figure 1 Full employment labour supply



The labour market is assumed to operate by the interplay of demand and supply, where for labour type *l* the supply curve is vertical and the changes in demand for labour type *l* are illustrated by shifts in the labour demand curve with the equilibrating variable being the price of labour. This assumption requires that there is strict separability between the determinants of labour allocation within and out with the production boundary.

Commentary

The assumption of strong separability implies that the determinations of the contributions to welfare from activities within and out with the production boundary are independent, which amounts to the presumption that changes in the labour market have no impact on welfare generated out with the production boundary. This suggests that this treatment is neutral with respect to welfare generated out with the production boundary.

But it achieves this apparent neutrality by assuming that RHGs make decisions about allocating labour irrespective of the price of labour within the production boundary, i.e., there can be NO tradeoffs between uses of labour within and out with the boundary. This renders this treatment of labour supply open to challenge, even for countries with no involuntary unemployment. However, it has the merit that the implicit presumption is that the active agents in the labour supply decisions are the RHGs.

For increases in wage rates the expected biases on the results will be higher than the 'correct' changes in wage rates, lower than the 'correct' changes in absorption and sub optimal estimates of welfare gains by RHGs.

Surplus Labour

The surplus labour assumption derives, implicitly, from Lewis's (1954) assumption that surplus labour can be drawn into the labour market at no marginal cost, i.e., at the current market wage. In Figure 2 this is the situation with aggregate labour demand of FD_l^1 where the wage rate is min WF_l and employment is Q_1. In the simplest application it is assumed that there is a perfectly elastic and infinite supply of labour available at the min wage rate (min WF_l). A more sophisticated alternative is to use a regime switching/MCP formulation; this assumes that while the employment is below Q_2 there is a perfectly elastic supply curve, i.e., fixed wage rate, but once demand reaches the level of Q_2 the labour supply curve becomes perfectly inelastic, i.e., vertical.[8] It is common to assume that only some types of labour, e.g., unskilled labour, have surplus labour. In these formulations it is the total factor supply (FS_l) that is the dependent variable.

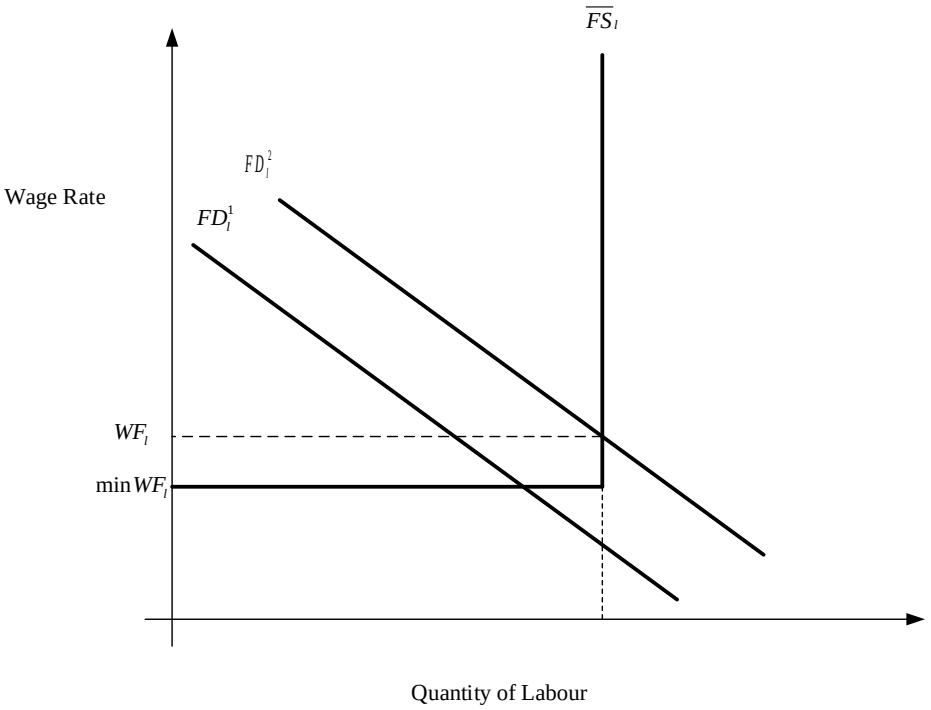
The labour market operates by means of the interplay of demand and supply. While the labour supply curve is perfectly elastic the equilibrating variable is the supply of labour and when the labour supply curve is perfectly inelastic the equilibrating variable is the wage rate. These assumptions require that there is strong separability between the determinants of labour allocation within and out with the production boundary but achieves this by assuming that labour can be drawn down from activities out with the production boundary at zero opportunity cost, i.e., the increase of employment within the boundary has no implications for the generation of welfare out with the boundary.

In most applications the quantity of each type of labour supplied, for each type of labour with surplus labour, is determined at the factor level, i.e., surplus labour is defined as a feature of the type of labour. Thus, the quantity of surplus labour is drawn into the market from each

[8] Other regime switching options are available. For instance, up to some level of employment the labour supply curve is perfectly elastic but after that level of employment the factor specific labour supply curve has a positive elasticity (see below for a factor specific labour supply curve with a positive elasticity) and then at some further level of employment the elasticity of the labour supply curve can become perfectly inelastic

household must be determined elsewhere in the model. A common presumption is that surplus labour is drawn from each household in the same proportions as recorded in the base case.[9]

Figure 2 Surplus Labour



An alternative formulation involves defining surplus labour at the level of the household, i.e., make $FSI_{l,h}$ the dependent variable. This allows greater flexibility in the determination of which households supply the extra labour but still requires some mechanism for determining how much of the surplus labour is drawn from each household.

Commentary

The surplus labour assumption has the apparent virtue of recognising the potential for involuntary unemployment, i.e., that there are persons in RHGs that would take employment at the current (real) wage rate if employment opportunities were available. This implies that the marginal utility of activities out with the production boundary is less than the marginal utility from wage income; although the marginal utility may not be zero. If the marginal utility is greater than zero then, by construction, for ANY CGE model with this behavioural

[9] This is a consequence of the presumption that the distribution of factor incomes is in fixed proportions, where the proportions are those observed in the base case.

relationship ANY policy change that induces increases employment will result in increases in measured absorption that will, at least in part, be realised from a reduction in the contribution to the welfare of RHGs from activities out with the production boundary.

This behavioural relationship avoids any need for tradeoffs between uses of labour within and out with the boundary, by the presumption of surplus labour. But it achieves this by the implicit presumption that RHGs are passive agents in the labour supply decisions, i.e., the labour supply decisions are taken by the factors not the RHGs, which conflicts with 'standard' economic theory.

For increases in wage rates the expected biases on the results will be lower than the 'correct' changes in wage rates, higher than the 'correct' changes in absorption and higher than the 'correct' estimates of welfare gains by RHGs.

Labour Supply Curves

In recent years several models have included 'upward sloping labour supply curves' that are notionally justified by reference to the wage curve (see Blanchflower and Oswald, 1995, for a summary). The typical behavioural relationship allows the total supply of each factor/labour type to increase/decrease as the factor/labour prices increase/decrease. This behavioural relationship means that the supply of labour depends on the wage rate and thereby mimics the empirical evidence that the supply of labour is price (wage rate) responsive.

It is pertinent to note that the wage curve literature by Blanchflower and Oswald is careful to avoid the interpretation associated with the use of upward sloping labour supply curves in the CGE literature

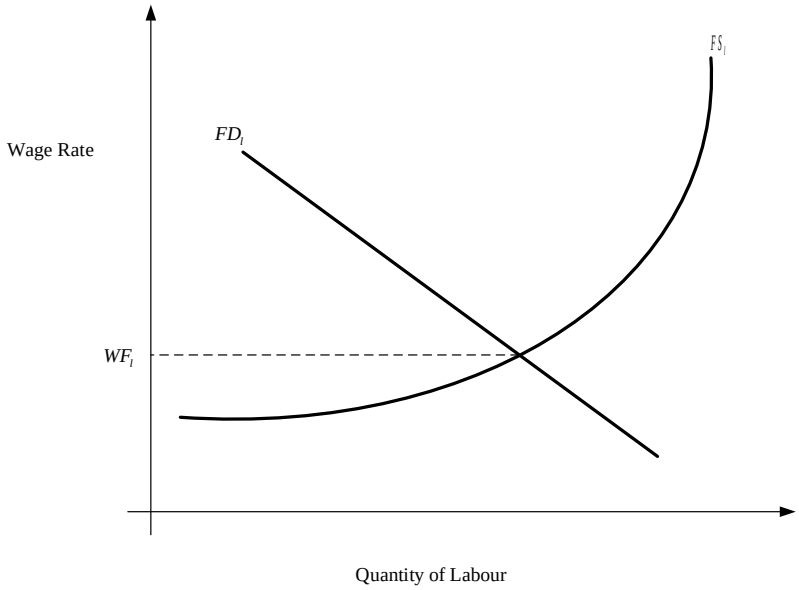
> *"The evidence given in The Wage Curve does not offer support for the idea that the negative correlation between pay and unemployment is explained by a labor [sic] supply function. The book argues that the demand and supply framework is the wrong way to think about the labor [sic] market. As Robert Solow's 1989 lectures at Berkeley suggest, there may be something special about labor as a commodity, and therefore about the labor [sic] market itself (p.3, Solow 1990)." (Blanchflower and Oswald, 1994).*

Factor Specific Labour Supply Curves

A standard formulation adopts the behavioural relationship $FS_l = f(WF_l)$, where the functional form is often a constant elasticity supply function: if wage rates increase the supply of labour increases and vice versa[10]. There are several things to note about this formulation

1. the dependent agents in the relationship are the labour factors;
2. the owners of the labour factors, i.e., RHG, are passive agents – once the quantities of labour are determined the RHG must provide the labour;
3. the quantities labour provided by each RHG must be determined elsewhere - a common presumption is that labour is drawn from each household in fixed proportions[11];
4. RHG change the amount of labour services provided in response to changes in wage rates, i.e., the behavioural relationship requires that there is an opportunity cost to RHGs associated with providing labour; and
5. the opportunity costs of changing the quantities of labour provided are not included in the models.

Figure 3 Factor Specific Labour Supply Curves



10 The first derivative of the function is positive.

11 None of the known models that include upward sloping labour supply curves endogenise the functional distribution of income. Specifically, the functional distribution of income is controlled in these models though matrices of parameters that embody the implicit presumption that the (proportionate) changes in factor supplies are identical across all RHGs.

Commentary

The application of factor specific labour supply curves is, superficially, appealing because it provides some reflection of the empirical evidence that changes in wage rates influence the supply of labour. The behavioural and theoretical foundations are not found in 'standard' economic theories; the owners of labour are depicted as passive agents whose preferences have no impact on labour supply decisions.[12] This runs counter to the theoretical foundations of all known CGE models wherein owners of labour, RHG, and activities are the active/decision making agents in the operation of factor markets.

While factor specific labour supply curves embody the assumption that there are opportunity costs associated with changes in labour supplies, they introduce changes in labour supplies as 'manna from heaven'; specifically, an increase in factor/labour supply has no opportunity cost other than the increases in wage rates. This means that when labour supplies by each RHG change the utility foregone, by RHGs, is zero, i.e., its marginal cost is zero, but labour only enters the labour market at a positive price, which increases measured activity due to the increased supply of labour and the increased wage rates. Consequently, for ANY CGE model with this behavioural relationship ANY policy change that induces increases in wage rates will result in increases in measured absorption that will, at least in part, be realised from a reduction in the contribution to the welfare of RHGs from activities out with the production boundary. Hence, the measured changes in the welfare of RHGs will be overstated.

Household Specific Labour Supply Curves

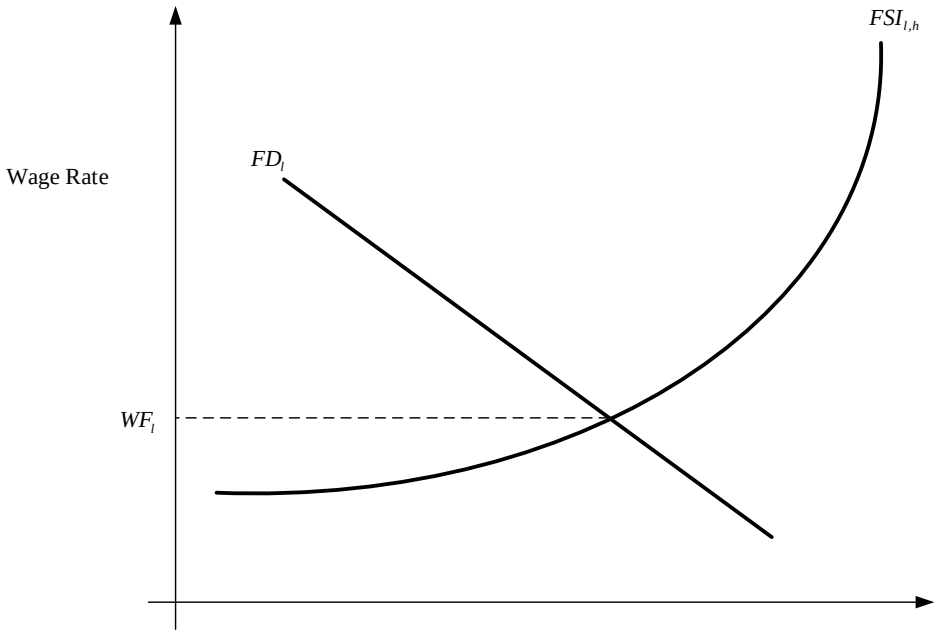
Two issues with factor specific labour supply curves can be avoided by introducing the labour supply curve at the level of the RHGs. This involves formulating the behavioural relationship $FSI_{l,h} = f(WF_l)$, where the functional form is a constant elasticity supply function: if wage rates increase the supply of labour by RHG *h* increases and vice versa[13]. There are several things to note about this formulation

1. the dependent agents in the relationship are the RHGs;

[12] The wage curve literature does not provide theoretical justification for its use.
[13] The first derivative of the function is positive.

2. the quantities labour provided by each RHG are endogenous and an equilibrating mechanism must be introduced for the for the factor markets that reconciles the decisions by the RHGs;
3. the functional distribution of income can endogenised by relating factor income distribution directly to factor ownership; and
4. the opportunity costs of changing the quantities of labour provided are not included in the models.

Figure 4 Household Specific Labour Supply Curves



Commentary

The application of household specific labour supply curves is, superficially, appealing because it provides some reflection of the empirical evidence that changes in wage rates influence the supply of labour. The owners of labour are depicted as active agents whose preferences impact on labour supply decisions,[14] but the behavioural and theoretical foundations are not found in 'standard' economic theories.

[14] The wage curve literature does not provide theoretical justification for its use.

Household specific labour supply curves embody the assumption that there are opportunity costs associated with changes in labour supplies, they introduce changes in labour supplies as 'manna from heaven'; specifically, an increase in factor/labour supply has no opportunity cost. This means that when labour supplies by each RHG change the utility foregone, by RHGs, is zero, i.e., its marginal cost is zero, but it only enters the labour market at a positive price, which increases measured activity due to the increased supply of labour and the increased wage rates. Consequently, for ANY CGE model with this behavioural relationship ANY policy change that induces increases in wage rates will result in increases in measured absorption that will, at least in part, be realised from a reduction in the contribution to the welfare of RHGs from activities out with the production boundary. Hence, the measured changes in the welfare of RHGs will be overstated.

For increases in wage rates the expected biases on the results will be higher than the 'correct' changes in wage rates, higher than the 'correct' changes in absorption and estimates of welfare gains by RHGs. The impacts on income distribution are uncertain, although they are likely to be biased in favour of the relatively wealthy households who might be expected to be less responsive to increases in wage rates.

Labour Trade offs

Labour Trade-offs

'Standard' economic theory argues that the supply of labour depends on some trade-off between utility derived from 'leisure' and consumption, which is a function of wage income from labour time. In these theories 'leisure' is representative of all activities taking place out with the production boundary, whether these activities generate utility by being directly productive, e.g., social reproduction, or through 'true' leisure.[15] This requires considering the household/individual's 'full time labour supply' which comprises of time devoted to paid employment and activities out with the production boundary; this approach allows the substitution (trade-off) between time in paid employment and activities out with the production boundary. Apart from the argument that labour supply depends on the trade-off between activities out with the production boundary and consumption/work, accounting for

[15] It is worth noting the observation that "utility is a metaphysical concept of impregnable circularity" (Robinson, 1962, p 48).

labour/leisure trade-off is relevant since outcomes of economic analyses tend to depend on the mechanism governing the allocation of 'full time endowment' between employment and activities out with the production boundary (Goettle *et al*., 2009), and the trade-off between these uses of time is the major cost of adjustment/response costs.

Incorporating labour trade-off means that the consumption basket of a typical household comprises of goods, both purchased and home produced, and services, both purchased and produced out with the production boundary. 'Leisure' can, in this context be conceived of as a service produced by a household by the application of labour time owned by the household and can only be consumed by that household; thereby satisfying the conditions assumed for such services in the SNA. Then, household utility is defined at 'full consumption' levels rather than only on goods and services produced within the production boundary. BUT, the problem of the unique determination of prices, that largely drives the location of the production boundary in the SNA, must be resolved for this option work.

This model of labour trade-offs is part of the 'standard' toolbox of orthodox microeconomic theory. The 'standard' model of a labour-leisure trade-off is a preliminary to a model where the 'full time endowment' is part of the constraint set and households are seeking to allocate time over all economic activities to maximise welfare/utility. In the standard textbooks the concept of a production boundary is typically not considered, but the implicit presumption is that the model is defined over the *general* production boundary. As such the model is a general representation of choice by households over the allocation of time between employment and self-employment, that generates income to fund purchased consumption, and self-employment used to produce services, including leisure, out with the SNA production boundary.

Labour trade-offs are not the same for all groups of households and individuals facing a labour supply decision; they will depend on observed and unobserved characteristics of each agent. For example, retired persons will not have same labour trade-off as those in the working age group; self-employed persons' labour-supply decision may differ significantly from those made by employees. The incorporation of the trade-off between labour/consumption and leisure is crucial for accounting for these empirical observations.

Implicit to this model is a presumption that there is no involuntary unemployment, since time allocated to activities out with the production boundary is treated, implicitly, as a residual. This is reflected in the SNA's statement that "[I]f the production boundary were extended to include the production of personal and domestic services by members of households for their own final consumption, all persons engaged in such activities would become self-employed, making unemployment virtually impossible by definition." (SNA, 2008, 1.42). But while the concept that there is no involuntary unemployment is embraced by several schools of economics it is far from universally accepted; hence the presumption that the allocation of time between activities within and out with the production boundary is a consequence of optimizing decisions unconstrained by access to paid employment or self-employment may not be deemed acceptable.

The extension of a CGE model to include utility maximisation by RHGs over their 'full time endowment', requires that the model uses a *general* production boundary, i.e., a boundary that encompasses activities within and out with the SNA production boundary. One option is to record each RHG as having its own unique activities that generate services produced out with the SNA's production boundary.[16] Assume, for simplicity, that there is an activity for each RHG that produces 'leisure' that can only be consumed by the matched RHG using labour supplied only by the RHG and, optionally, some intermediate inputs.[17] Then, in the database, 'leisure' is classed as a 'commodity' produced by the RHG at home using its own time as an input, and the total amount of leisure produced is entirely consumed within the household itself.

The household's allocation of full consumption between 'leisure' and demand for goods and services is then determined by the changes in the relative prices of commodities, which in turn influences the prices of factors. Incorporating the labour trade-offs increases the policy relevance of the resultant data and model by

1. representing the actual labour supply and consumption decision rules of RHGs;
2. RHGs are the active agents in the decisions about labour supply;

[16] This approach has been used to model HPHC and 'leisure' in the STAGE_DEV model.

[17] It would be expected that such inputs are recorded as expenditures by RHGs in income and expenditure surveys, so their allocation to the intermediate input category may be tricky.

3. the quantities labour provided by each RHG are endogenous and an equilibrating mechanism is the maximisation of welfare by the RHGs;
4. the functional distribution of income is endogenised by relating factor income distribution directly to factor ownership; and
5. allowing for a wide range of policy options in experiments.

BUT there are some problems

1. the existence of unemployment is logically inconsistent since RHG can always, by construction, use unemployed labour to increase utility; and
2. the definition of prices may be subject to criticism.

Commentary

Labour and commodity tax policy, and environmental analyses are some of the policy experiments that can be conducted more effectively in situations where the trade-offs are recognised. The level and consequences of distortions caused by new taxes on labour incomes, can be examined using such models and databases. Taxes on labour income can distort the labour/leisure trade-off by making leisure time more attractive than labour time; or in other words such taxes can make the consumption of commodities more expensive relative to the consumption of leisure. Bringing in the labour trade-off can also have use for environmental policy analysis to identify appropriate environmental policies that can raise revenue while reducing distortions in labour incomes. It also finds applicability on analysis of sustainable development and food systems in a world increasingly constrained by the growing challenges of food availability.

Importantly, adding labour trade-offs ensures that the opportunity costs to RHGs from decisions to change their allocations of labour between activities within and without the production boundary are explicitly represented. There is a problem with determining the appropriate wage rates for the valuation of labour used by each RHG out with the production boundary. In part this is offset by using linear homogenous models (it is the changes in relative prices that determine changes in allocations), but this does not resolve issues with the valuation of consumption of commodities from within and services from out with the production boundary (shares a relevant to the operation of the utility functions of RHGs).

For increases in wage rates RHGs will allocate more labour to activities within the boundary, which is consistent with theory. Such a reallocation will generate increases in measured absorption that will increase utility, while the contribution to RHG utility from activities out with the boundary will decline. The expected outcome will be an increase in welfare at the level of the RHG. The impacts on income distribution and 'aggregate' welfare are uncertain: they will depend upon the changes in the wage rates for different types of labour and the pattern of labour ownership by RHGs.

4 Concluding Comments

The interaction between economic activities out with the SNA production boundary but within the *general* production boundary and the operation of labour markets is an important consideration in CGE models. In the CGE models the production boundary is important in the definition of the activities encompassed by the model but also identifies the dimensionality of the labour force. This is particularly so for the SNA's production boundary, which explicitly defines the criteria for the measurement of the labour force and defines what is included and excluded in major economic aggregates, e.g., private consumption and GDP/GNI.

All CGE models must contain an implicit, if not explicit, production boundary. In all CGE models that do not include activities out with that production boundary introduce a degree of tension. If the such models induce transfers of labour from out with to within the boundary, the welfare loss from labour use in activities out with the boundary are ignored, or assumed equal to zero, whereas if full-employment is imposed the labour supplies are independent of the wage rates.

These issues can be circumvented, to a greater or lesser extent, by including RHG specific activities that capture production out with the production boundary and within the *general* boundary. But including these activities adds a data intensive process to a data gathering exercise that is already substantial. But the effort may be justified because of the relative importance of activities within and with out the boundary.

Appendix: Extracts from the SNA

The extracts below are selections from the SNA related to the SNA's specification of the production boundary; they are not exhaustive.

Overview

2. The production boundary (pp 6-7)

1.40 The activity of production is fundamental. In the SNA, production is understood to be a physical process, carried out under the responsibility, control and management of an institutional unit, in which labour and assets are used to transform inputs of goods and services into outputs of other goods and services. All goods and services produced as outputs must be such that they can be sold on markets or at least be capable of being provided by one unit to another, with or without charge. The SNA includes within the production boundary all production actually destined for the market, whether for sale or barter. It also includes all goods or services provided free to individual households or collectively to the community by government units or NPISHs.

Household production

1.41 The main problem for defining the range of activities recorded in the production accounts of the SNA is to decide upon the treatment of activities that produce goods or services that could have been supplied to others on the market but are actually retained by their producers for their own use. These cover a very wide range of productive activities, in particular:

a. The production of agricultural goods by household enterprises for own final consumption;

b. The production of other goods for own final use by households: the construction of dwellings, the production of foodstuffs and clothing, etc.;

c. The production of housing services for own final consumption by owner occupiers;

d. The production of domestic and personal services for consumption within the same household: the preparation of meals, care and training of children, cleaning, repairs, etc.

All of these activities are productive in an economic sense. However, inclusion in the SNA is not simply a matter of estimating monetary values for the outputs of these activities. If values are assigned to the outputs, values have also to be assigned to the incomes generated by their production and to the consumption of the output. It is clear that the economic significance of these flows is very different from that of monetary flows. For example, the incomes generated are automatically tied to the consumption of the goods and services produced; they have little relevance for the analysis of inflation or deflation or other disequilibria within the economy. The inclusion of large non-monetary flows of this kind in the accounts together with monetary flows can obscure what is happening on markets and reduce the analytic usefulness of the data.

1.42 The SNA is designed to meet a wide range of analytical and policy needs. A balance has to be struck between the desire for the accounts to be as comprehensive as possible and the need to prevent flows used for the analysis of market behaviour and disequilibria from being swamped by nonmonetary values. The SNA therefore includes all production of goods for own use within its production boundary, as the decision whether goods are to be sold or retained for own use can be made even after they have been produced, but it excludes all production of services for own final consumption within households (except for the services produced by employing paid domestic staff and the own-account production of housing services by owner-occupiers). The services are excluded because the decision to consume them within the household is made even before the service is provided. The location of the production boundary in the SNA is a compromise, but a deliberate one that takes account of the needs of most users. In this context it may be noted that in labour force statistics economically active persons are defined as those engaged in productive activities as defined in the SNA. If the production boundary were extended to include the production of personal and domestic services by members of households for their own final consumption, all persons engaged in such activities would become self-employed, making unemployment virtually impossible by

definition. This illustrates the need to confine the production boundary in the SNA and other related statistical systems to market activities or fairly close substitutes for market activities.

Other production boundary problems

1.43 Certain natural processes may or may not be counted as production depending upon the circumstances in which they occur. A necessary condition for an activity to be treated as productive is that it must be carried out under the instigation, control and responsibility of some institutional unit that exercises ownership rights over whatever is produced. For example, the natural growth of stocks of fish in the high seas not subject to international quotas is not counted as production: the process is not managed by any institutional unit and the fish do not belong to any institutional unit. On the other hand, the growth of fish in fish farms is treated as a process of production in much the same way that rearing livestock is a process of production. Similarly, the natural growth of wild, uncultivated forests or wild fruits or berries is not counted as production, whereas the cultivation of crop-bearing trees, or trees grown for timber or other uses, is counted in the same way as the growing of annual crops. However, the deliberate felling of trees in wild forests, and the gathering of wild fruit or berries, and also firewood, counts as production. Similarly, rainfall and the flow of water down natural watercourses are not processes of production, whereas storing water in reservoirs or dams and the piping, or carrying, of water from one location to another all constitute production.

1.44 These examples show that many activities or processes that may be of benefit to institutional units, both as producers and consumers, are not processes of production in an economic sense. Rainfall may be vital to the agricultural production of a country but it is not a process of production whose output can be included in GDP.

3. The consumption boundary

1.45 The coverage of production in the SNA has ramifications that extend considerably beyond the production account itself. The boundary of production determines the amount of value added recorded and hence the total amount of income generated by production. The range of goods and services that are included in household final consumption expenditures, and actual consumption, is similarly governed by the

production boundary. For example, these expenditures include the estimated values of the agricultural products consumed by households that they have produced themselves and also the values of the housing services consumed by owner occupiers, but not the values of "do-it-yourself" repairs and maintenance to vehicles or household durables, the cleaning of dwellings, the care and training of children, or similar domestic or personal services produced for own final consumption. Only the expenditures on goods utilized for these purposes, such as cleaning materials, are included in household final consumption expenditures.

The SNA and Measures of Welfare (pp 12-13)

2. Unpaid services and welfare

1.78 The production boundary of the SNA is such that the services produced and consumed by households are not included except for the imputed rental of owner-occupied dwellings and the payments made to domestic staff. Similarly, no estimate is included in the SNA for the labour services of individuals provided without cost to non-profit institutions. In both these cases, the contribution of time increases the welfare of other individuals in the community. The exclusion of these services from the production boundary is not a denial of the welfare properties of the services but a recognition that their inclusion would detract from rather than add to the usefulness of the SNA for the primary purposes for which it is designed, that is economic analysis, decision-taking and policymaking.

3. The impact of external events on welfare

1.79 The level of an individual's and a nation's welfare may be affected by a wide range of factors that are not economic in origin. Consider the effects of an exceptionally severe winter combined with an influenza epidemic. Other things being equal, the production and consumption of a number of goods and services may be expected to rise in response to extra demands created by the cold and the epidemic; the production and consumption of fuels, clothing and medical services will tend to increase. As compared with the previous year, people may consider themselves to be worse off overall because of the exceptionally bad weather and the epidemic,

notwithstanding the fact that production and consumption may have increased in response to the additional demand for heating and health services. Total welfare could fall even though GDP could increase in volume terms.

1.80 This kind of situation does not mean that welfare cannot be expected to increase as GDP increases, other things being equal. Given the occurrence of the cold and the epidemic, the community presumably finds itself much better off with the extra production and consumption of heating and health services than without them. There may even be a general tendency for production to rise to remedy the harmful effects of events that reduce people's welfare in a broad sense. For example, production may be expected to increase in order to repair the damage caused by such natural disasters as earthquakes, hurricanes and floods. Given that the disaster has occurred, the extra production presumably increases welfare. However the question remains how changes in welfare should be measured over time; a community that has suffered a natural disaster will have a higher level of welfare if damage is repaired than if it is not, but how does this new level of welfare compare to the situation in the absence of the disaster?

4. The impact of externalities on welfare

1.81 Some production activities cause a loss in welfare that is not captured in the SNA. A factory, for example, may generate noise and emit pollutants into the air or nearby water systems to the extent of causing a loss of amenity and thus a loss of welfare to individuals living nearby. As long as there is no financial penalty to the factory, the consequences go unmeasured in the SNA. If, in response to government legislation or otherwise, the factory incurs expenditures that reduce the noise or quantity of pollutants emitted, costs will rise and so will welfare but again the match is not necessarily one to one and the level of welfare after the ameliorations may still be lower than it might be if the factory simply closed down.

1.82 Environmental externalities are a major cause of concern both as regards measuring welfare and indeed economic growth itself. In response to these concerns, a satellite account of the SNA has been developed and is being refined to try to answer such questions.

Chapter 6: The Production Account

2. The production boundary (pp 97-100)

6.23 Given the general characteristics of the goods and services produced as outputs, it becomes possible to define production. A general definition of production is given first, followed by the rather more restricted definition that is used in the SNA. Following this there is a discussion of the production boundary as it affects household activities and non-observed activities.

The general production boundary

6.24 Economic production may be defined as an activity carried out under the control and responsibility of an institutional unit that uses inputs of labour, capital, and goods and services to produce outputs of goods or services. There must be an institutional unit that assumes responsibility for the process of production and owns any resulting goods or knowledge-capturing products or is entitled to be paid, or otherwise compensated, for the change-effecting or margin services provided. A purely natural process without any human involvement or direction is not production in an economic sense. For example, the unmanaged growth of fish stocks in international waters is not production, whereas the activity of fish farming is production.

6.25 While production processes that produce goods can be identified without difficulty, it is not always so easy to distinguish the production of services from other activities that may be both important and beneficial. Activities that are not productive in an economic sense include basic human activities such as eating, drinking, sleeping, taking exercise, etc., that it is impossible for one person to employ another person to perform instead. Paying someone else to take exercise is no way to keep fit. On the other hand, activities such as washing, preparing meals, caring for children, the sick or aged are all activities that can be provided by other units and, therefore, fall within the general production boundary. Many households employ paid domestic staff to carry out these activities for them.

The production boundary in the SNA

6.26 The production boundary in the SNA is more restricted than the general production boundary. For reasons explained below, activities undertaken by households that

produce services for their own use are excluded from the concept of production in the SNA, except for services provided by owner-occupied dwellings and services produced by employing paid domestic staff. Otherwise, the production boundary in the SNA is the same as the more general one defined in the previous paragraphs.

6.27 The production boundary of the SNA includes the following activities:

a. The production of all goods or services that are supplied to units other than their producers, or intended to be so supplied, including the production of goods or services used up in the process of producing such goods or services;

b. The own-account production of all goods that are retained by their producers for their own final consumption or gross capital formation;

c. The own-account production of knowledge-capturing products that are retained by their producers for their own final consumption or gross capital formation but excluding (by convention) such products produced by households for their own use;

d. The own-account production of housing services by owner occupiers; and

e. The production of domestic and personal services by employing paid domestic staff.

The production boundary within households

The exclusion of most services produced for own use by households

6.28 The production of services by members of the household for their own final consumption has traditionally been excluded from measured production in national accounts and it is worth explaining briefly why this is so. It is useful to begin by listing those services for which no entries are recorded in the accounts when they are produced by household members and consumed within the same household:

a. The cleaning, decoration and maintenance of the dwelling occupied by the household, including small repairs of a kind usually carried out by tenants as well as owners;

b. The cleaning, servicing and repair of household durables or other goods, including vehicles used for household purposes;

c. The preparation and serving of meals;

d. The care, training and instruction of children;

e. The care of sick, infirm or old people;

f. The transportation of members of the household or their goods.

6.29 In most countries a considerable amount of labour is devoted to the production of these services, and their consumption makes an important contribution to economic welfare. However, national accounts serve a variety of analytical and policy purposes and are not compiled simply, or even primarily, to produce indicators of welfare. The reasons for not imputing values for unpaid domestic or personal services produced and consumed within households may be summarized as follows:

a. The own-account production of services within households is a self-contained activity with limited repercussions on the rest of the economy. The decision to produce a household service entails a simultaneous decision to consume that service. This is not true for goods. For example, if a household engages in the production of agricultural goods, it does not follow that it intends to consume them all. Once the crop has been harvested, the producer has a choice about how much to consume, how much to store for future consumption or production and how much to offer for sale or barter on the market. Indeed, although it is customary to refer to the own-account production of goods, it is not possible to determine at the time the production takes place how much of it will eventually be consumed by the producer. For example, if an agricultural crop turns out to be better than expected, the household may dispose of some of it on the market even though it may have originally supposed it would consume it all. This kind of possibility is non-existent for services; it is not possible to produce a service and then decide whether to offer it for sale or not.

b. As the vast majority of household services are not produced for the market, there are typically no suitable market prices that can be used to value such services. It is therefore extremely difficult to estimate values not only for the outputs of the services but also for the associated incomes and expenditures that can be meaningfully added to the values of the monetary transactions on which most of the entries in the accounts are based.

c. With the exception of the imputed rental of owner occupied dwellings, the decision to produce services for own consumption is not influenced by and

does not influence economic policy because the imputed values are not equivalent to monetary flows. Changes in the levels of household services produced do not affect the tax yield of the economy or the level of the exchange rate, to give two examples.

6.30 Thus, the reluctance of national accountants to impute values for the outputs, incomes and expenditures associated with the production and consumption of services within households is explained by a combination of factors, namely the relative isolation and independence of these activities from markets, the extreme difficulty of making economically meaningful estimates of their values, and the adverse effects it would have on the usefulness of the accounts for policy purposes and the analysis of markets and market disequilibria.

6.31 The exclusion of household services from the production boundary has consequences for labour force and employment statistics. According to International Labour Organization (ILO) guidelines, economically active persons are persons engaged in production included within the boundary of production of the SNA. If that boundary were to be extended to include the production of own account household services, virtually the whole adult population would be economically active and unemployment eliminated. In practice, it would be necessary to revert to the existing boundary of production in the SNA, if only to obtain meaningful employment statistics.

Own-account production of goods

6.32 Although services produced for own consumption within households fall outside the boundary of production used in the SNA, it is nevertheless useful to give further guidance with respect to the treatment of certain kinds of household activities which may be particularly important in some developing countries. The SNA includes the production of all goods within the production boundary. The following types of production by households are included whether intended for own final consumption or not:

a. The production of agricultural products and their subsequent storage; the gathering of berries or other uncultivated crops; forestry; wood-cutting and the collection of firewood; hunting and fishing;

b. The production of other primary products such as mining salt, cutting peat, etc.;

c. The processing of agricultural products; the production of grain by threshing; the production of flour by milling; the curing of skins and the production of leather; the production and preservation of meat and fish products; the preservation of fruit by drying, bottling, etc.; the production of dairy products such as butter or cheese; the production of beer, wine, or spirits; the production of baskets or mats; etc.;

d. Other kinds of processing such as weaving cloth; dress making and tailoring; the production of footwear; the production of pottery, utensils or durables; making furniture or furnishings; etc.;

e. The supply of water is also considered a goods producing activity in this context. In principle, supplying water is a similar kind of activity to extracting and piping crude oil.

6.33 It is not feasible to draw up a complete, exhaustive list of all possible productive activities but the above list covers the most common types. When the amount of a good produced within households is believed to be quantitatively important in relation to the total supply of that good in a country, its production should be recorded. Otherwise, it may not be worthwhile trying to estimate it in practice.

Services of owner-occupied dwellings

6.34 The production of housing services for their own final consumption by owner occupiers has always been included within the production boundary in national accounts, although it constitutes an exception to the general exclusion of own-account service production. The ratio of owner occupied to rented dwellings can vary significantly between countries, between regions of a country and even over short periods of time within a single country or region, so that both international and inter-temporal comparisons of the production and consumption of housing services could be distorted if no imputation were made for the value of own-account housing services. The imputed value of the income generated by such production is taxed in some countries.

Production of domestic and personal services by employing paid domestic staff

6.35 Although paid domestic staff produce many of the services excluded from the production boundary of the SNA when undertaken by household members, paying a

person who comes to the house to wash, cook or look after children, for example, is as much a market activity as taking clothes to a laundry, eating at a restaurant or paying a nursery to care for children. By convention, though, only the wages of the domestic staff are treated as the value of output. Other materials used in their work are treated as household consumption expenditure because of the difficulty of identifying what is used by the staff and what by household members. Nor are payments to other household members treated as payments for services even if the payments are nominally for the performance of chores, for example pocket-money paid to children. "Do-it-yourself" decoration, maintenance and small repairs

6.36 "Do-it-yourself" repairs and maintenance to consumer durables and dwellings carried out by members of the household constitute the own-account production of services and are excluded from the production boundary of the SNA. The materials purchased are treated as final consumption expenditure.

6.37 In the case of dwellings, "do-it-yourself" activities cover decoration, maintenance and small repairs, including repairs to fittings, of types that are commonly carried out by tenants as well as by owners. On the other hand, more substantial repairs, such as replastering walls or repairing roofs, carried out by owners, are essentially intermediate inputs into the production of housing services. However, the production of such repairs by an owner-occupier is only a secondary activity of the owner in his capacity as a producer of housing services. The production accounts for the two activities may be consolidated so that, in practice, the purchases of materials for repairs become intermediate expenditures incurred in the production of housing services. Major renovations or extensions to dwellings are fixed capital formation and recorded separately.

The use of consumption goods

6.38 The use of goods within the household for the direct satisfaction of human needs or wants is not treated as production. This applies not only to materials or equipment purchased for use in leisure or recreational activities but also to foodstuffs purchased for the preparation of meals. The preparation of a meal is a service activity and is treated as such in the SNA and ISIC Rev.4. It therefore falls outside the production boundary when the meal is prepared for own consumption within the household. The use of a durable good, such as a vehicle, by persons or households for their own

personal benefit or satisfaction is intrinsically a consumption activity and should not be treated as if it were an extension, or continuation, of production.

The "non-observed" economy

6.39 There is considerable interest in the phenomenon of the non-observed economy. This term is used to describe activities that, for one reason or another, are not captured in regular statistical enquiries. The reason may be that the activity is informal and thus escapes the attention of surveys geared to formal activities; it may be that the producer is anxious to conceal a legal activity, or it may be that the activity is illegal. Chapter 25 discusses measurement of the informal economy within households.

6.40 Certain activities may clearly fall within the production boundary of the SNA and also be quite legal (provided certain standards or regulations are complied with) but deliberately concealed from public authorities for the following kinds of reasons:

a. To avoid the payment of income, value added or other taxes;

b. To avoid the payment of social security contributions;

c. To avoid having to meet certain legal standards such as minimum wages, maximum hours, safety or health standards, etc.;

d. To avoid complying with certain administrative procedures, such as completing statistical questionnaires or other administrative forms.

6.41 Because certain kinds of producers try to conceal their activities from public authorities, it does not follow that they are not included in national accounts in practice. Many countries have had considerable success in compiling estimates of production that cover the non-observed economy as well as the ordinary economy. In some industries, such as agriculture or construction, it may be possible by using various kinds of surveys and the commodity flow method to make satisfactory estimates of the total output of the industry without being able to identify or measure that part of it that is not observed. Because the non-observed economy may account for a significant part of the total economy of some countries, it is particularly important to try to make estimates of total production that include it, even if it cannot always be separately identified as such.

6.42 There may be no clear borderline between the nonobserved economy and illegal production. For example, production that does not comply with certain safety, health or other standards could be described as illegal. Similarly, the evasion of taxes is

itself usually a criminal offence. However, it is not necessary for the purposes of the SNA to try to fix the precise borderline between non-observed and illegal production as both are included within the production boundary in any case. It follows that transactions on unofficial markets that exist in parallel with official markets (for example, for foreign exchange or goods subject to official price controls) must also be included in the accounts, whether or not such markets are actually legal or illegal.

6.43 There are two kinds of illegal production:

a. The production of goods or services whose sale, distribution or possession is forbidden by law;

b. Production activities that are usually legal but become illegal when carried out by unauthorized producers; for example, unlicensed medical practitioners.

6.44 Examples of activities that may be illegal but productive in an economic sense include the manufacture and distribution of narcotics, illegal transportation in the form of smuggling of goods and of people, and services such as prostitution.

6.45 Both kinds of illegal production are included within the production boundary of the SNA provided they are genuine production processes whose outputs consist of goods or services for which there is an effective market demand. The units that purchase smuggled goods, for example, may not be involved in any kind of illegal activities and may not even be aware that the other party to the transaction is behaving illegally. Transactions in which illegal goods or services are bought and sold need to be recorded not simply to obtain comprehensive measures of production and consumption but also to prevent errors appearing elsewhere in the accounts. The incomes generated by illegal production may be disposed of quite legally, while conversely, expenditures on illegal goods and services may be made out of funds obtained quite legally. The failure to record illegal transactions may lead to significant errors within the accounts if the consequences of the activity are recorded in the financial account and the external accounts, say, but not in the production and income accounts.

6.46 Regular thefts of products from inventories are not included in the value of output. Suppose a shop suffers regular theft from inventories. In calculating the value of output of the shop, part of the margin on the goods sold must cover the cost of the goods stolen. Thus the margin is calculated as the value received for the goods sold

less the cost of both the goods sold and the goods stolen. If the stolen products are sold elsewhere, for example on a street stall, the value of the output of the street trader is still calculated as the difference between the value received for the goods and the value paid for them. In this case, though, if nothing is paid for the goods, the whole of the sales value appears as the margin.

6.47 Illegal production does not refer to the generation of externalities such as the discharge of pollutants. Externalities may result from production processes that are themselves quite legal. Externalities are created without the consent of the units affected and no values are imputed for them in the SNA.

6.48 Although non-observed and illegal activities require special consideration, it is not necessarily the case that they are excluded from normal data collection processes.

Chapter 9: The Use of Income Accounts

3. Expenditure on goods and services produced on own account (pp 185-6)

9.53 When institutional units retain goods or services produced by themselves for their own final consumption or gross fixed capital formation, they clearly bear the costs themselves. They are, therefore, recorded as incurring expenditures whose values have to be estimated using the basic prices of similar goods or services sold on the market or their costs of production in the absence of suitable basic prices.

9.54 Household final consumption expenditure includes estimates for the values of goods or services produced as outputs of unincorporated enterprises owned by households that are retained for consumption by members of the household. The production of services for own consumption within the same household falls outside the production boundary of the SNA, except for housing services produced by owner-occupiers and services produced by employing paid domestic staff. As the costs of producing goods or services for own consumption are borne by the households themselves, it is clear that the expenditures on them are also incurred by households, even 186 System of National Accounts though their values must be estimated indirectly. The main types of goods and services produced and consumed within the same household are as follows:

a. Food or other agricultural goods produced for own final consumption by farmers, including subsistence farmers, or others for whom agricultural production is only a secondary, or even a leisure, activity;

b. Other kinds of goods produced by unincorporated enterprises owned by households that are consumed by members of the same households;

c. Housing services produced for own final consumption by owner-occupiers (discussed further below); and

d. Domestic or other services produced for own final consumption by households that employ paid staff for this purpose (domestic staff, cooks, gardeners, chauffeurs, etc.).

9.55 Values are estimated for these goods or services on the basis of the current basic prices of similar goods or services sold on the market, or by costs of production when suitable prices are not available, except for the services of paid staff; by convention, services of paid staff are valued simply by the compensation of employees paid, in cash and in kind.

Chapter 19: Population and Labour Inputs

1. International standards on labour force Statistics (p 405)

19.5 Clearly, if a ratio is to be formed between measures of output and labour input, the concept of labour used must match the coverage of production in the SNA. The relevant standards on the labour force are maintained by the International Labour Organization (ILO). The ILO standards are contained in “resolutions”, which are adopted by sessions of the International Conference of Labour Statisticians (ICLS). The resolution of 2008 confirms that the economically active population is defined in terms of individuals willing to supply labour to undertake an activity included in the SNA production boundary.

19.6 Not everyone who is economically active works for a resident institutional unit. It is therefore particularly important that the concept of residence underlying the population estimates be consistent with that for labour force estimates and that the

residence of individuals included in employment estimates are consistent with the criterion of resident institutional unit in the SNA.

C. Measuring the labour force (pp 406-408)

19.16 Not all individuals included in the population are engaged in production. Some are too young, some too old and some may simply choose not to work. Others may usually work but be temporarily not working because of illness, lack of employment or being on holiday, for example. A first step in moving from population data to data for employment, is thus to define what is meant by the labour force.

19.17 The labour force consists of those who are actively prepared to make their labour available during any particular reference period for producing goods and services that are included within the production boundary of the SNA. The labour force is further divided into those who are employed and those who are unemployed. Thus the population of the country can be subdivided into three categories; employed, unemployed and not in the labour force. A person's status depends on their activity (or lack of it) during a particular reference period (usually a week).

19.18 Because the labour force is defined with reference to a short period, the number of persons in the labour force at any time may be smaller than the economically active population. For example, seasonal workers may be the labour force at certain times of year.

19.19 The labour force consists of four groups of persons; residents who are employees of resident institutional units, residents who are employees of non-resident institutional units, unemployed residents and self-employed persons. (A self-employed person is necessarily associated with a resident household. If such a person provides goods and services abroad, these are recorded as exports.) Employment in the SNA is defined as all persons, both employees and self-employed persons, engaged in some productive activity that falls within the production boundary of the SNA and that is undertaken by a resident institutional unit.

1. Employees

19.20 Employees are persons who, by agreement, work for a resident institutional unit and receive remuneration for their labour. Their remuneration is recorded in the SNA as

compensation of employees. The relationship of employer to employee exists when there is an agreement, which may be formal or informal, between the employer and a person, normally entered into voluntarily by both parties, whereby the person works for the employer in return for remuneration in cash or in kind. There is no requirement that the employer should declare the agreement to any official authority for the status of employee to apply.

19.21 Employees include but are not confined to the following categories:

a. persons (manual and non-manual workers, management personnel, domestic staff, people carrying out remunerated productive activity under employment programs) engaged by an employer under a contract of employment;
b. civil servants and other government employees whose terms and conditions of employment are laid down by public law;
c. the armed forces, consisting of those who have enlisted for both long and short engagements and also conscripts (including conscripts working for civil purposes);
d. ministers of religion, if they are paid directly by general government or a non-profit institution;
e. owners of corporations and quasi-corporations if they work in these enterprises;
f. students who have a formal commitment whereby they contribute some of their own labour as an input into an enterprise's process of production in return for remuneration and (or) education services;
g. disabled workers, provided that the formal or informal relationship of employer to employee exists;
h. persons employed by temporary employment agencies, who are to be included in the industry of the agency which employs them, and not in the industry of the enterprise for which they actually work.

19.22 An outworker is a person who agrees to work for a particular enterprise or to supply a certain quantity of goods and services to a particular enterprise by prior arrangement or contract with that enterprise, but whose place of work is not within it. An outworker is treated as an employee if there is an explicit agreement that the

outworker is remunerated on the basis of the work done, that is the amount of labour contributed as an input into some process of production. There is further discussion of the classification of outworkers in paragraphs 7.34 to 7.38.

19.23 Persons temporarily not at work are also considered as employees provided they have a formal job attachment. This formal attachment should be determined according to one or more of the following criteria: a. the continued receipt of wage or salary; b. an assurance of return to work following the end of the contingency, or an agreement as to the date of return; c. the elapsed duration of absence from the job which, wherever relevant, may be that duration for which workers can receive compensation benefits without obligations to accept other jobs. Persons included in the above classification are those temporarily not at work because of illness or injury, holiday or vacation, strike or lockout, educational or training leave, parental leave, reduction in economic activity, temporary disorganization or suspension of work due to such reasons as bad weather, mechanical or electrical breakdown, or shortage of raw materials or fuels, or other temporary absence with or without leave. For some purposes, it may be useful to distinguish employees temporarily not at work if this is possible.

19.24 Managers of corporations (or quasi-corporations) are treated in the SNA as employees but the ILO classification regards them as self-employed.

2. Self-employed persons

19.25 Self-employed persons are persons who are the sole or joint owners of the unincorporated enterprises in which they work, excluding those unincorporated enterprises that are classified as quasi-corporations. Persons who work in unincorporated enterprises are classed as selfemployed persons if they are not in paid employment that constitutes their principal source of income; in that latter case, they are classified as employees. They may be temporarily not at work during the reference period for any specific reason. The compensation for self-employment is included in mixed income because it is not possible to observe separately the return to labour from the return to any capital used in the unincorporated enterprise. (For some analytical purposes it may be useful to estimate a breakdown. See paragraphs 20.49 to 20.50)

19.26 Self-employed persons also include the following categories:

a. contributing family workers working in unincorporated enterprises;

b. outworkers whose income is a function of the value of the outputs from some process of production for which they are responsible, however much or little work was put in;

c. workers engaged in production undertaken entirely for their own final consumption or own capital formation, either individually or collectively. (An example of the last is communal construction.)

19.27 Contributing family workers are sometimes called unpaid workers but there are other unpaid, or voluntary, workers.

19.28 In ILO statistics, self-employed persons include those working in enterprises that are legally unincorporated even if there is sufficient information available for them to be treated as quasi-corporations in the SNA. In the SNA the remuneration of these people is included in compensation of employees rather than in mixed income. Among others, this may include members of producers' cooperatives.

3. Unemployment

19.29 To complete the picture of the labour force, it is necessary to mention unemployment because the labour force is divided between employed persons (that is, employees plus self-employed persons) plus those who are unemployed. An unemployed person is one who is not an employee or self-employed but available for work and actively seeking work. The concept of unemployed persons is not required in the national accounts because the unemployed do not contribute to production but their numbers are necessary to make the conceptual transition from the employed population to the economically active population.

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