Ethiopian Journal of Economics

Volume VIII Number 2 October 1999

ETHIOPAN ECONOMIC ASSOCIATION

Volume VIII Number 2 October 1999

Ethiopian Journal of Economics

A Publication of
THE ETHIOPIAN ECONOMIC ASSOCIATION
(EEA)

ETHIOPIAN JOURNAL OF ECONOMICS

VOLUME VIII NUMBER 2 OCTOBER 1999

Published: JULY 2003

EQUITY POTENTIALS FOR TAX REFORM IN ETHIOPIA*

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Abstract

In order to analyze the issue of equity potentials for tax reform in Ethiopia, this paper makes use of Household Income, Consumption, and Expenditure Survey data to derive concentration curves for one direct tax and commodity taxes for six goods and a service as well as the Lorenz Curve for Expenditures. The findings indicate that reforming the tax system in such a way as to reduce taxes on food items and salt while compensating the revenue loss by increased collection from the personal income tax and taxes on sugar and telecommunication services may improve social welfare.

1. INTRODUCTION

The development paradigms of the 1960s and the 1970s, which favored a large public sector, induced post-independence African governments to increasingly rely on taxes to meet their fiscal needs. As a result tax policies and reforms were mostly initiated on grounds of revenue adequacy, i.e. enabling governments to raise as much tax revenue as their fiscal needs require.

However, in the derivation of optimal tax system, other features of taxes such as economic efficiency, equity, and administrative efficacy need to be taken into consideration. This is not only because these other canons of a good tax system are worth striving for by their own account but also because all the principles are not mutually exclusive. For instance, the taxes' administrative efficiency characterized by their relative ease of collection might have contributed to heavy reliance on foreign trade taxes in Ethiopia. But, such situations are known to entail large distributional (equity) costs (Hammer 1996).

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* The final version of this article was submitted in April 2003.

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I acknowledge the valuable comments of Ato Mulat Mekonen in the Ministry of Finance and Economic Development.

In recent years, equity issues have come to take center stage in development debates due primarily to two reasons. First, empirical evidence from successful East Asian economies has gone some way to disprove the long held view that there is a trade-off between augmenting growth and reducing inequality. The idea that unequal distribution of income is necessary for, or the likely consequence of, rapid economic growth stems from the works of Kaldor (1978) and Kuznets (1955).

The former argues that since a high level of savings is a prerequisite for rapid growth, income must be concentrated in the hands of the rich whose marginal propensity to save is relatively high. Kuznets, on the other hand, argues that as labour shifts from sectors with low productivity to sectors with high productivity, aggregate inequality must initially increase substantially and decrease only later.

Second and more importantly, massive social cost of recent economic reforms, in terms of increased incidence and depth of poverty have reinforced interest on equity concerns. A well-evidenced study on how strongly adjustment-induced reductions in government expenditure affected the poor is provided in a United Nations Children Fund report prepared by Cornia, Julia and Stewart(1987).

In light of the changes in development thinking explained above, it would be worthwhile to look into the potentials of the Ethiopian tax system in promoting social justice objectives by reducing inequality in the distribution of income or consumption or any other welfare measure. Accordingly, this article presents a comparative analysis of the performance of some selected taxes in Ethiopia with respect to their equity implications. In broad terms, it tests the presence of equity grounds to reform the tax system in Ethiopia.

It should, nevertheless, be noted that it is beyond the scope of a partial equilibrium analysis such as this study to accommodate simultaneously impacts of other factors like economic and administrative efficiencies of the taxes or viability of using the tax system vis-à-vis other policy instruments as a redistributive tool.

The rest of the paper is organized as follows: Section II assesses equity considerations included in the tax laws of Ethiopia while Section III presents the conceptual framework and analytical methodology. Section IV discusses data and results and Section V is devoted to making conclusions.

2. EQUITY CONSIDERATIONS IN THE ETHIOPIAN TAX LEGISLATION

Identifying individual taxes or the whole tax system or progressive, neutral or regressive is making reference to that section of society which bears most of the tax burdens. By and large, the ultimate distributional outcome of a tax is a function of

two interrelated factors. These are the provisions of the tax legislation and the pattern of shifting tax burdens between economic agents. The former refers mainly to statutory marginal tax rates and levels of tax exemptions while the latter considers changes in price levels and/or factor payments.

Provisions are included in most of the Ethiopian tax laws to address equity concerns. The structure of the personal income tax is examined as an example of direct taxes. According to proclamation No.109/1994, a monthly personal income of up to Birr 120 is untaxed while consecutively rising marginal rates are applied on five income brackets. However such an increasing marginal tax rate structure satisfies only a necessary condition for being classified as a progressive tax. A tax is said to be progressive when the marginal tax line is everywhere above the average tax line. Also, note should be taken of the presumption that for direct taxes physical and effective incidences overlap.

A progressive income tax takes an increasing proportion of a rising income. In other words, the tax rate increases as the base increases. If, for instance, average rates of the tax equal marginal rates it implies that the tax system treats an additional income earned at high and low income brackets equally. Hence average tax rates, calculated over total income, need always lie below marginal rates, which are derived for a given income bracket. Table 1 indicates the extent to which the personal income tax in Ethiopia is progressive.

Table1: Progressiveness of the Ethiopian Personal Income Tax

Income Bracket (Birr/month)	Marginal tax rates (percent)	Average tax rates* (percent)
0-120	0	0
121-600	10	8
601-1200	15	11.5
1201-2000	20	14.9
2001-3000	30	19.9
>3000	40	24.9

Source: Derived from proc. No.107/1994

* In calculating the average rates, the upper class limits of each income bracket are taken. This doesn't compromise the picture as those figures represent the maximum the average rate can go under the given income bracket. For the last income bracket, a hypothetical income level of Birr 4000 is taken.

The impact of tax legislations on the distribution of tax burdens among different socioeconomic groups is limited for indirect taxes mainly imposed upon consumption of goods and services. A number of empirical works prove that producers shift the burden of commodity taxes to consumers through upward changes in retail prices. However, the degree of shifting is very much dependent upon the relative strength of

price elasticities of demand and supply. For commodities characterized by inelastic demand, we may observe prices rising by the full amount of the tax.

This scenario in which producers pass on tax burdens to consumers tells only part of the story concerning the ultimate distributional outcome of indirect taxes. This is because consumers do not share the tax burdens evenly, rather in accordance with amount of the taxed items purchased. Hence, tax burdens of commodity taxes for a particular household are modeled to be linear in the share of income spent on such goods and services.

In Ethiopia, a number of provisions in consumption tax proclamations can be ascribed to vertical equity considerations. The Sales and Excise tax proclamation No.68/1993 and by Proclamation No.77/1997 which amended it exhibit implicit attempt by government to address adverse equity implications of the taxes. Accordingly, basic food items like bread and 'injera' are exempted from such taxes. Similarly, service outputs deemed particularly essential to low income households are not taxed.

These legislations are based on two important economic principles. Firstly, exempting food from consumption taxes conforms with Engel's law which states that proportion of income spent on acquisition of food is higher for poorer households. Hence, the tax burdens on these households correspondingly decline as a result of the exemption. Secondly, the likelihood for producers to pass on such taxes to consumers is so high as to warrant the inclusion of the exemption provision in the tax law.

Once the tax legislations are introduced for equity purposes, assessing their impact on inter household distribution of welfare is important because such provisions cost the government in the form of tax revenue forgone. The reorientation of economic policy towards meeting poverty reduction objectives would be all the more reason to look into the equity implications of the tax system.

Generally, commodity taxes are regressive as saving is a positively monotonic function of income. Put differently, the higher the income of an individual, the higher would be the saving. This implies that the individual would very likely bear a smaller proportion of the expenditure taxes on commodities. In either scenario, i.e. when food is considered taxable or when it is exempted, the overall incidence pattern regressive. Low income households that fall between annual income range of Birr 399.5 and Birr 1699.5 (inclusive) spend more than 85% of their income on purchase of taxable items while the figure for high income households [Birr 14399.5, Birr 20000] is below 74%.

Table 2: Breakdown of household expenditures on taxable items

Income Group (Annual Income in Birr)	Class mark*	% of income spent on taxable items (food taxable)	% of income spent on taxable items (food exempted)
<=599	399.5	87.91	77.31
600-999	799.5	86.21	79.79
1000-1399	1199.5	86.76	80.55
1400-1999	1699.5	85.81	80.60
2000-2599	2299.5	83.53	78.56
2600-3399	2999.5	84.14	79.14
3400-4199	3799.5	84.96	80.74
4200-5399	4799.5	79.82	76.35
5400-6599	5999.5	81.61	77.90
6600-8999	7799.5	78.85	76.61
9000-12599	10799.5	75.83	72.68
12600-16199	14399.5	73.63	71.18
16200-19999	18099.5	74.81	72.35
>=20000	20000	74.74	71.98

Source: calculated from CSA survey (1998).

* In order to have a representative income level for each income bracket, class mark is calculated by dividing by 2 the sum of the lower and upper limits of the income class. Only the floor of the income variable is known for the highest income class and to circumvent this problem its lower limit is taken as its class mark.

Although exemption of food from taxation did not make the tax burden distribution pattern neutral or progressive, it has clearly helped reduce the steepness of the incidence line. In other words, it has made the taxes more acceptable interms of equity. It should be noted that when food is tax exempt, the alterations in the pattern of tax burdens stems primarily from changes that occurred at the lower steps of the income ladder.

Considering the lower income group individually [399.5, 1699.5] this is the only case where the incidence pattern is reversed from regressive to progress as a result of the exemption of food from taxation. Besides, as a consequence of this exemption, the share of income spent on taxable items falls by 10.6 percentage points for the lowest income group but the gains for the highest income group stands at only 2.76 percentage points.

All in all, equity concerns are addressed in Ethiopian tax laws through differential rate structure in direct taxes and for indirect taxes through tax exemption of goods and services that take up the bulk of income of low income households, in indirect taxes.

3. CONCEPTUAL FRAMEWORK AND ANALYTICAL METHODOLOGY

The need to undertake tax incidence analysis arises primarily from the close correlation between a country's economic well-being and its pattern of distribution of income or wealth. The idea that the entities required by law to pay a tax may not necessarily converge with those whose real purchasing power is reduced following the imposition of the tax, dates as far back as to the time of Ricardo. In addition, economic agents differ in their capacities to make uniform responses to reduce tax liabilities as a result of wide ranging factors.

One such case cited by Younger and others (1999) is 'avoiding a tax by changing one's pattern of consumption or income'. Accordingly, households that have high elasticities of demand for, say, gasoline can avoid paying a tax on gasoline consumption by switching to substitutes with little loss in welfare, while those with an inelastic demand cannot do the same so easily.

Most of the earlier theoretical developments regarding tax incidence centered around the direction and size of tax shifting. In the literature the terms "shifting assumptions", incidence assumptions", and "sources and uses side effects" are interchangeably used to refer to the treatments adopted to allocate tax burdens.

Essentially, there are three approaches to incidence: balanced, differential and absolute. The balanced budget incidence approach varies taxes and expenditures simultaneously on condition that full employment is maintained. The differential incidence approach, on the other hand, analyzes the effect of substituting one type of tax by another while real expenditures are held constant. Finally, there is the absolute incidence approach, which is associated with the process of inflation or deflation.

Earlier empirical studies on incidence were mainly undertaken in a Marshallian partial equilibrium framework. Mieszkowski (1969) provides a broader account of earlier tax incidence studies. A pioneering work which represented a departure from such studies was that of Arnold C.Harberger (1962). Harberger made a non econometric study of incidence of the corporate income tax in the U.S. under a general equilibrium framework. He found that imposition of the corporate tax makes, in the short run, the tax burden fall entirely on earnings of fixed capital equipment in the affected industry. In the long run, and in response to the tax induced disequilibrium in the capital market, redistribution of resources will force 'equalization' of net returns to labour and capital in all sectors. However, his model hinges on strong assumptions such as perfect factor mobility, fixed aggregate factor supplies, and a closed economic system.

Other notable works in the area include those of J.F. Due (1970) and Shah and Whalley (1991). Due showed that in imperfectly competitive economies, a general sales or production tax is borne in relation to consumption spending and that a value-added tax of the income type was equivalent to general consumption tax; Shah and Whalley argued in favour of including the particular features of developing countries in tax incidence analysis. An interesting study in this respect was done later by Clarete (1994) who applied an explicit computable general equilibrium model to analyze the burden of the Philippines tax system. By modeling such stylized features of developing countries as foreign exchange rationing, quantitative import restrictions, rent seeking and a Harris-Todaro labour market distortion, Clarete found results which are at variance with conventional, fully-flexible, price models.

The methodological framework for this study is drawn from the work of Yitzhaki and Selmrod (1991). The choice is particularly justified for the following reasons. First, unlike most other approaches, it enables comparison of individual taxes on their effectiveness in distributing tax burdens there-by making it possible to decide on the direction of equity-driven tax reform. Secondly, extent of data required by general equilibrium models makes them prohibitive and beyond the scope of this study.

The analytical methodology basically tests for 'welfare dominance' which refers to the superiority (or inferiority) of a given tax over another on grounds of equity for a welfare measure under consideration. This involves two steps:

i) The first step derives concentration curves which align households grouped in an ascending order of level of welfare along the horizontal axis and the cumulative proportion of taxes paid along the vertical axis. Outstanding issues here are choosing an appropriate welfare measure and estimating the amount of tax incurred by each household welfare group.

We choose household levels of expenditures as welfare measures for both practical and theoretical reasons. Younger, et al (1999) argue that households expenditures are preferred to income as welfare measures because households tend to report their expenditures more accurately than income. Bedsides, according to the life-cycle/permanent income hypothesis, expenditures provide better representation of long-term welfare than income as households try to smooth their consumption given income fluctuations over time.

ii) The second step involves adjusting the tax structure in such a way as to slightly decrease taxes on certain goods while at the same time increase taxes on other goods and still keeping total tax revenue constant. This improves social welfare if the concentration curves for the former are every where above the concentration curves for the latter.

Equivalently, concentration curves for items which slice off a larger proportion of income of the poor than the rich are above those which take up a relatively larger percentage of income of the rich. This was proved by Yizhaki and Slemrod (1991).

Analytical insights can also be drawn by comparing the concentration curves to the Lorenz curve for expenditures and the 45^{o} line. A concentration curve below the Lorenz curve for expenditures implies that the tax is progressive while the reverse represents a regressive tax. Moreover, the nearer the concentration curve for a tax to the 45^{o} line the more regressive the tax is.

4. DATA AND RESULTS

The data for the study is drawn mainly from the revised report of the 1995/96 Household Income, Consumption, and Expenditure Survey (CSA, 1998). Particularly attention is given to that part of the survey on urban locations as market exchange of goods and services is more pronounced in these areas. The choice of the specific items for analysis is based on the value of their relative contributions to total tax revenue as well as on compatibility between tax amount calculations from the survey and actual tax figures.

One direct tax and taxes on six consumption items are considered in the analysis. These are the tax on wage labour (i.e. the Personal Income Tax) and expenditure taxes on alcoholic beverages, tobacco, sugar, salt, communication services, and food. In order to justify the exemption of bread and other basic food items from taxation, the slot on bread and other prepared food in the survey is deducted from per household level of expenditure on food. Taxes are calculated using the following steps:

1) For each of the fourteen income groups of the survey, taxes are derived as functions of levels of consumption of an item except for income tax on wages and salaries which is directly included in the survey. Assuming that commodity taxes are fully shifted to consumers, the per household levels of expenditure are adjusted using tax rates to produce assessed tax payments. The major consumption taxes under consideration are sales and excise taxes.

The following example highlights the calculations of the tax amounts. According to the survey, the per household value of expenditure on alcoholic beverage of income group [3400, 4199] is 20.84. At the time, 12% of sales tax and an excise tax the rate of which differs as per type of drink are levied. Since the survey doesn't differentiate between types of alcoholic drink, a simple average of the rates, which is 90%, is taken to represent excise tax on alcoholic drinks. Hence, the tax amount for this

specific household becomes 21.2 (i.e. [20.84*0.12]+[20.84*0.9]. A similar exercise is followed for all goods and service considered. Another issue to note is that the survey includes consumption of sugar and salt only in volume terms. As a result, price levels of Birr 1.00 and Birr 5.00 are applied for salt and sugar, respectively, to do the conversions into monetary values.

2) The income groupings entered in Survey are not totally convenient for analysis as they comprise a widely differing number of households. Hence, in order to make a better income grouping, the data is reorganized in such a way that each income group represents a decile. In certain cases, the number of households in a given income group directly fits into the corresponding decile while for other situations the number of households for an income group enters two consecutive deciles. For instance the first two income groups directly fit into the first decile that is the poorest 10%. But the leftover which is about 67553.5 is partly drawn from income group [1000,1399]. Expenditure and tax cumulative shares are given in appendix. After all the derivations, the basic data translates into the following table.

As shown in Fig.1, the concentration curves of tax on food and income tax lie above and below the Lorenz curve for expenditure, respectively, implying that the former is regressive and the latter progressive. This result clearly conforms with earlier pattern of the distribution of the tax burdens presented in Tables 1 and 2. Relatively richer households assume the bulk of the income tax burden. Nevertheless, households at the lower income levels take up a larger portion of the food tax burden as a reflection of the underlining importance of food in the budgets of these households.

Table 3: Amount of assessed tax values by decile (in mill. Birr)

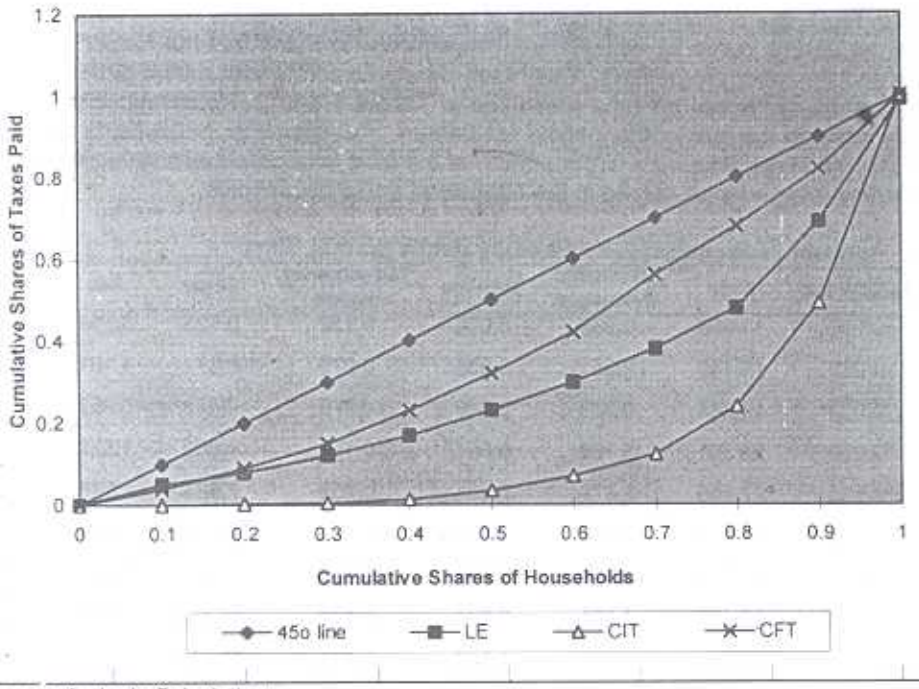
No.	Income tax	Food	Alcoholic Beverages	Tobacco	Telecommuni -cation	Sugar	Salt
1st	0.097	11.355	0.909	0.021	0.132	0.523	0.554
2nd	0.287	15.149	2.551	0.038	0.075	0.871	1.101
3rd	0.524	18.964	0.883	0.046	0.078	2.673	0.952
4th	2.036	24.351	3.736	0.057	0.189	4.902	1.527
5th	4.530	27.646	2.779	0.101	0.239	7.889	1.845
6th	7.040	31.538	4.296	0.089	0.296	6.996	1.974
7th	10.870	43.833	5.400	0.046	0.436	9.515	2.249
8th	24.190	39.383	4.131	0.071	0.413	13.313	2.751
9th	51.260	44.807	4.076	0.045	1.006	26.451	3.551
10th	104.960	60.813	6.111	0.029	3.507	49.441	4.427

Source: Author's Calculations.

The nearness of the concentration curve of tax on food to the 45° line further proves that the tax is regressive. When exemption is not provided (not shown here) tax on food would be extremely regressive since the concentration curve of tax on food would fall much nearer to the 45° line. The Lorenz Curve for Expenditure and the concentration curve of tax on food seem to overlap for the poorest 20% of the households. This suggests that over this range, the tax is either neutral or mildly progressive indicating that the bulk of the gains from the exemption provision had accrued to the lowest income households.

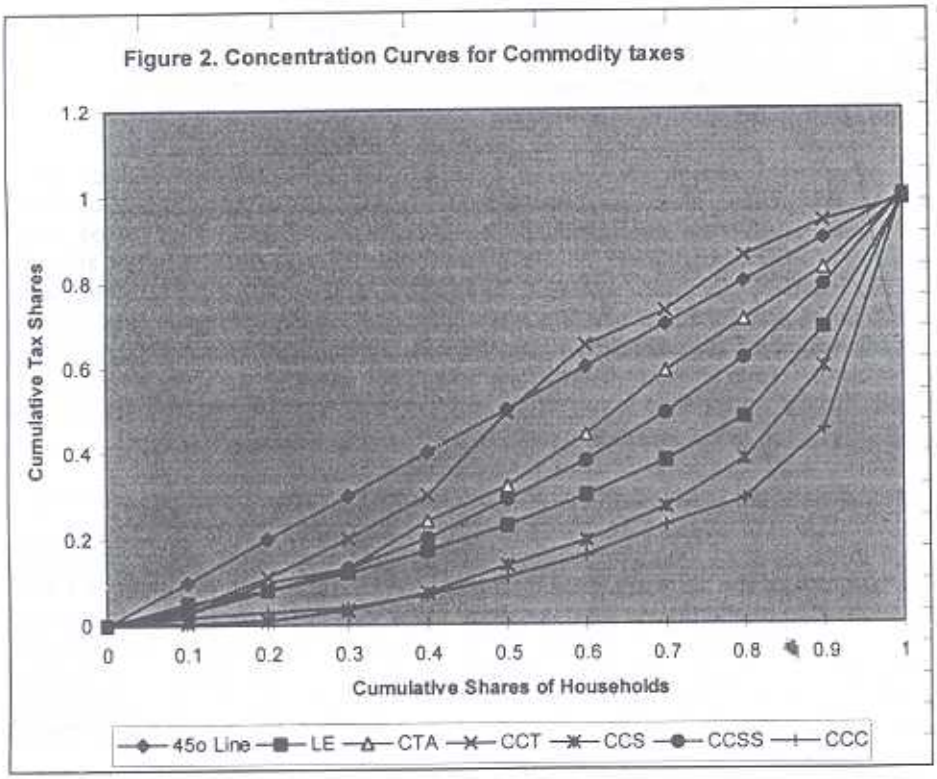
In contrast to the tax on food, the pattern of distribution of income tax burden is highly progressive. The cumulative share of tax paid by the poorest half of the households stands at about 5% while the share for the top decile alone is about 50%. This scenario may, however, be partly explained by a high likelihood for low income households to engage in informal employment which escapes taxation.

Figure 1. Concentration Curves for Food and Income Tax



Source: Author's Calculations

NB LE stands for Lorenz Curve for expenditures, CIT stands for Concentration Curve for income tax, CFT stands for Concentration Curve for tax on food.



Source: Author's calculations

NB. CTA stands for concentration curve for tax on alcohol, CCT stands for concentration Curve for tax on tobacco, CCS stands for concentration curve for tax on sugar, CCSS stands for concentration curve for tax on salt, CCC stands for concentration curve for tax on communication services.

The preceding discussions indicate that there may exist some potential to reform taxes in Ethiopia on equity grounds. If exempting a couple of food items benefits the poor, it could be possible to broaden the scope for equity-based reform by further identifying and exempting, large budget goods and services for low income households. The likely loss in tax revenue can be compensated by taking discretionary measures in raising tax collection from the personal income tax.

This can be achieved in at least two ways. Increasing marginal tax rates is an option even if it sparks a strong outcry on the ground that such a move compromises economic efficiency. The economic impact of taxing labour is a net outcome of a positive income effect and a negative substitution effect and therefore unless empirically tested for the specific Ethiopian situation, the option of introducing higher marginal rates should not be rejected outright. In fact, several empirical studies cited

by Auld and Miller (1984) show that the income tax is neutral in its impact on the choice individuals between work and leisure. A less contentious possibility is improving the administrative efficiency of taxation by minimizing not only the cost of collection but also the number of evasions.

On the other hand, commodity taxes in Ethiopia diverge in their performance with respect to distribution of tax burdens (Figure 2). Except for telecommunications services and sugar, the redistributive implications of all the other taxes are regressive. In other words, lower income households assume relatively larger shares of the tax burdens for salt, alcoholic beverages, and tobacco. However, the concentration curves for sugar and telecommunications services are positioned below the Lorenz curve for expenditure and hence it is higher income households which bear the larger share of taxes associated with these commodities. It can also be observed that tax on tobacco is extremely regressive in view of the closeness of its concentration curve to the 45^{o} line.

The cumulative share of taxes on sugar and telecommunication services paid by the poorest thirty percent is less than one- fourth of the tax burden which the same group assumes in the case of tobacco. Tobacco is then welfare dominant over both sugar and telecommunication services. Reducing taxes on tobacco while at the same time taxing sugar and telecommunication services more may improve social welfare as this exercise tantamount to, ceterus paribus, decreasing the taxable outlay of the poor. The wisdom of such reform should, nevertheless, be further explored if raising taxes on the latter makes the commodities increasingly unaffordable to the poor and if tobacco consumption is considered an undesirable good by the social welfare function.

Similarly, measures that decrease tax on salt while increasing tax on sugar and telecommunication services are likely to be welfare improving given that its concentration curve lies entirely above those of the two commodities. It is shown in the figure that the poorest and the richest deciles pay about the same tax shares, which violates the "ability-to-pay" principle for tax equity. Yet, the reverse is true for sugar and telecommunication services. To tax salt less while at the same time taxing sugar and telecommunication services more would be equivalent to changing the income distribution pattern in pro-poor direction.

At first sight, the virtue of imposing higher taxes on sugar and telecommunication services while reducing those on tobacco consumption might be questionable. Increasing taxes on the former might have the adverse effect of making them unaffordable to the poor while decreasing tax on the latter could bring about health hazards. However, such concerns may not have strong theoretical and practical foundations for reasons pinpointed below.

If demand for tobacco is price inelastic, reducing taxes on its consumption may not lead to increased consumption of the good. Nevertheless the tax-induced fall in consumer price of the product would have a positive impact on the real income of households. As the commodity takes up a relatively larger share in the consumption basket of low income households, gains from its reduced price would also be proportionally higher for them. Moreover, educational and awareness creation programmes could be more effective in discouraging tobacco consumption than tampering with the price system. The experience in more developed countries attests to this view.

In order to address possible negative effects of taxing telecommunication services more, a multi-tier tax framework could be envisaged. This might apply differential rates in accordance with the type of service provided or the area located. With regard to sugar it is important to take note that not only levels of prices but availability could be a factor for the low level of its consumption by the poor.

V. CONCLUSIONS

In order to ensure better compliance from tax payers, the government should put in place an equitable tax system. Taxes, by affecting a country's income or wealth distribution, shape its economic well-being. It is, therefore, a useful exercise from policy perspective to investigate the distribution of tax burdens among different socio-economic groups.

The paper looked into provisions in the Ethiopian tax legislations which address equity concerns. It, specifically, considered the impact, on the distribution of tax burdens, of applying differential marginal statutory rates for the personal income tax and sales tax exemptions for food. However, the main focus of the study was to undertake a comparative analysis of selected individual taxes with respect to how equitable they are.

The paper has shown that the rate structure in the personal income taxes has resulted in a progressive tax since the marginal rates are overall above the average tax rates. It should be underlined that a rising marginal rates structure is not a sufficient condition for a direct tax to be progressive. The rates need also exceed the corresponding average tax rates. Similarly, exempting food from expenditure taxes has helped to make the taxes less regressive. More importantly, most of the gains accrued to the lowest income group.

The tax concentration curves and Lorenz curve for expenditures indicate that reforming the tax system in such a way as to raise collection from the personal income tax while reducing tax on food items could improve social welfare. This is not only because spending on food takes up the bulk of income of poor households but also their participation in formal labour markets is minimal.

The analysis on consumption of sugar, salt, tobacco, alcoholic beverages, as well as telecommunication services shows the direction tax reform on an equity platform should take. Accordingly, salt is found to be welfare-dominant over sugar and telecommunication services and hence discretionary tax measures that reduce tax on salt while compensating revenue loss with an increase on sugar and telecommunication services would be welfare improving. Lower income households also seem to bear unproportionally higher burden of taxes on tobacco and alcoholic beverages.

When everything is considered, there exists some potentials to reform taxes in Ethiopia on grounds of equity. Already introduced tax provisions have also produced certain equity gains. Furthermore, commodities differ in their impact on distribution of tax burdens which implies that it is possible to readjust the tax system in order to improve social welfare.

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APPENDIX

Household Cumulative Expenditure and Tax shares

No.	Expenditure	Income tax	Food	Alcoholic Beverages	Tobacco	Tele. services	Sugar	Salt
1	0.05	0.0004	0.04	0.03	0.04	0.02	0.004	0.03
2	0.08	0.0017	0.09	0.10	0.11	0.03	0.011	0.08
3	0.12	0.0042	0.15	0.13	0.20	0.04	0.033	0.13
4	0.17	0.0141	0.23	0.24	0.30	0.07	0.073	0.20
5	0.23	0.0361	0.32	0.32	0.49	0.11	0.137	0.29
6	0.30	0.0703	0.42	0.44	0.65	0.16	0.194	0.38
7	0.38	0.1231	0.56	0.59	0.73	0.23	0.272	0.49
8	0.48	0.2406	0.68	0.71	0.86	0.29	0.381	0.62
9	0.69	0.4897	0.82	0.83	0.94	0.45	0.597	0.79
10	0.99	0.9997	1.01	1.00	0.99	1.00	1.000	1.00

Source: Author's calculations

IS TECHNICAL PROGRESS LABOUR OR CAPITAL SAVING? THE CASE OF THE ETHIOPIAN MANUFACTURING SECTOR*

Admit Zerihun**

Abstract

The nature of technical progress in the industrial sector of a country has implications on formulating its industrial policy, which should fine-tune the direction of its dynamic comparative advantage. In view of this, this paper examines, using econometric models whether the technical progress in the Ethiopian manufacturing sector is capital or labour saving.

The outcome of the study shows that the production technology in the Ethiopian manufacturing sector is capital consuming and labour saving, contrary to the theory of initial factor endowments of the country. It also indicates that technological choice was inappropriate and technological capability acquisition was not built-in in the Ethiopian manufacturing enterprises.

According to the findings of this paper, for Ethiopia to industrialise, manufacturing firms in the country have to build the necessary technological capabilities through experience in production and investment on education. They should also make deliberate efforts to adapt and improve technologies to fit the prevailing Ethiopian conditions. The government is also required to help firms develop their technological capabilities. Towards this end, it has to create an enabling environment, develop mechanisms to protect selected manufacturing enterprises and subsidise firm-level research and development.

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* The final version of this article was submitted in February 2003.

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1. INTRODUCTION

Globalisation has become an issue of great concern. Integration of economies through-out the world by way of trade, financial flows, the exchange of technology and information, and the movement of people have been promoted by international organisations for its consumption and production efficiency, access to new technologies and attraction of capital/foreign direct investment. Both the challenge and opportunities of globalisation are crucial for developing countries like Ethiopia. The effects of globalisation in these countries will lead to marginalisation, joblessness and social unrest through these impacts on the labour market. Under these conditions competitiveness is the only means for survival and growth.

Most authoritetic use the term competitiveness to refer to an advantage of firms or industries vis-à-vis their competitors in domestic or international markets. For them, competitiveness is simply the capacity to sell one's product profitably. To be competitive, a firm must be able to undercut the prices or offer products of better quality than its competitors. At the enterprise or industry level, producers are deemed to be competitive if their unit cost of production is cheaper or equal to those of their competitors both in the domestic and the international markets. In this case, the indicator of competitiveness is unit cost ratio. Searching for sectors or activities in which there is a competitive advantage is crucial. Searching for a sustainable competitive advantage is even more crucial.

Neither the static Hecksher-Ohlin theory nor product cycle theories are sufficient to explain the evolution of comparative/competitive advantage. For this reason least developing countries like Ethiopia should neither be prisoners of initial factor endowments nor mere imitators of earlier industrialised countries (Herbert-Copley, 1990: 1464). There is room for manoeuvring their own policies. Initial factor endowments or the prevailing comparative advantage of any country can be changed, on the ground that sufficient consideration is accorded to technological capability acquisition. Technology here should be understood to mean as defined by Fransman (1984:9-10), which states that it encompasses every thing pertaining to the transformation of inputs into outputs including social organisation of the production and labour process, knowledge and competition. Any change on any of them will bring technological change since they have a bearing on the transformation of inputs into outputs. Technological capability acquisition implies building up the capacity to search for and select technologies for use in particular environments; operate, assimilate, adapt and modify processes and products in the light of the prevailing conditions of a country.

The rate, pace and direction of technical progress (all the traits and activities of acquiring technological capability) achieved in any country could alter factor

endowments and hence the dynamic comparative advantage of that country. But the rate, pace and direction should follow the right course.

The nature of technical progress, i.e. whether it is labour or capital savings has implications on formulating industrial policy which should fine-tune the direction of the dynamic comparative advantage of a country.

The objective this paper is to identify whether the technical progress in the Ethiopian manufacturing industries is labour saving or capital saving. By examining the issues raised in the preceding paragraph, the paper intends to produce empirical evidence in the area, which is patchy at far as the Ethiopian manufacturing sector is concerned.

2. TECHNICAL PROGRESS: CONCEPT AND MEASUREMENT

2.1. Concept

There seems to be no consensus among scholars on the concept of technical progress. That is why Kennedy and Thirlwall (1972: 12) said, "over the years the term technical progress has been given a range of meanings and interpretations".

However, there is a convergence of thought in one respect. At least, all agree that it is an addition/advance in technological knowledge, which has a bearing on production. Technical progress includes all forces, which raise the combined productivity of all factors of production. It is a shift in the production possibility frontier over time that enables to produce greater output with the same volume of inputs. It is a move towards the best-practised production possibility frontier through learning.

Technical progress has two potential sources; namely, technical change and technological progress. Technical change refers to a change and/or an alteration of the choice of techniques out of the existing knowledge. It is the acquisition of knowledge through experience in production (the process of learning-by-doing). Jackson (1982: 339) describes this as follows:

> *... as the work force becomes accustomed to, and experienced in, the production process, the workers steadily learn how to do tasks more efficiently and quickly. At the beginning, nothing is routine, everything is unfamiliar, and it takes time to learn how to cope with snags. After time, everything is routine and familiar, and the quickest and best way of dealing with snags and awkward parts is well known.*

Technological progress implies an expansion in international technology and an addition to the stock of technological knowledge. The following table can summarise technological advance.

Table 1: Technological Advance Matrix

Products/Services	Methods of Production		
	Existing Method	Improved Method	New Method
Existing Products/Services	1	4	7
Improved Products/Services	2	5	8
New Products/Services	3	6	9

Source: Jackson: 1982: 316.

The position indicated by the number 1 in the table above is the present state of production technology and any shift/movement from 1 to any one of the remaining eight positions produces technological changes.

Here, it should be noted that the introduction of unused but known technique or its diffusion is not a technological change. In practice, however, "it is extremely difficult to distinguish improvements in efficiency due to movements towards known production boundaries from the expansion of the boundaries themselves due to increases in knowledge" (Kennedy & Thirlwall, 1972: 12).

But lack of information or low level of capability would keep a good part of the world's technology in the dark. Hence, the diffusion of hitherto unused but known (or existing) techniques from somewhere could be considered as technical progress in countries like Ethiopia. Technical progress is also different from increasing returns to scale, as the former does not necessarily require addition to scale.

2.2. Measurement

There is not an easy and direct way of measuring technical progress. Kennedy and Thirlwill stated that "advance in knowledge per se defy direct meaningful quantification. The best that can be done is to measure technical change by its effects, such as its impact on the growth of total productivity..." (Kennedy & Thirlwall, 1972:13).

Measuring technical progress via its impact on output can be outlined as follows. Assume a general production function for two consecutive periods of the form:

$$Q_t = A_t F(L_t, K_t) \quad (1)$$

and

$$Q_{t+1} = A_{t+1} F(L_{t+1}, k_{t+1}) \quad (2)$$

Assume Y as output at time t+1 solely due to L_{t+1} and K_{t+1} inputs, i.e.,

$$Y = A_t F(L_{t+1}, K_{t+1}) \quad (3)$$

A_t measures the efficiency level at time t. The change from Q_t to Y is due to the change in L and K, and the change from Y to Q_{t+1} is due to 'technical progress'. Rate of technical progress will, therefore, be:

$$\frac{Q_{t+1} - Y}{Y} = \frac{A_{t+1}}{A_t} - 1 \quad (4)$$

Technical progress can, as well, be estimated using a general production function of the form:

$$Q = F[L(t), K(t), t] \quad (5)$$

where t is time. The change in output overtime is given by

$$\frac{dQ}{dt} = \frac{\partial F}{\partial L}\frac{dL}{dt} + \frac{\partial F}{\partial K}\frac{dk}{dt} + \frac{\partial F}{\partial t} \quad (6)$$

The change in output is decomposed into two: Change in output due to a movement along the production function and the change in output due to a shift in the production function or due to disembodied technical progress (see Intriligator, 1978:289). Dividing equation (6) by Q and multiplying the first two terms respectively by L/L and K/K yields:

$$\frac{1}{Q}\frac{dQ}{dt} = \frac{L}{Q}\frac{\partial F}{\partial L}\frac{1}{L}\frac{dL}{dt} + \frac{K}{Q}\frac{\partial F}{\partial K}\frac{1}{K}\frac{dk}{dt} + \frac{1}{Q}\frac{\partial F}{\partial t} \quad (7)$$

The first two terms on the right are the proportionate rate of change of the two inputs, each weighted by their respective elasticity of output. The third term is the proportionate rate of disembodied technical progress. Assuming the elasticity

remains fairly constant overtime and the proportionate rate of disembodied technical progress is constant at a rate m, equation (7) can be converted into the following:

$$\frac{1}{Q}\frac{dQ}{dt} = a\frac{1}{L}\frac{dL}{dt} + b\frac{1}{K}\frac{dk}{dt} + m \qquad (8)$$

where a and b are the labour and capital elasticity of output respectively. Solving for m and assuming dt=1, equation (8) turns out to be:

$$m = \frac{dQ}{Q} - a\frac{dL}{L} - b\frac{dk}{K} \qquad (9)$$

Rate of technical progress is thus the difference of output change from the combined input change; inputs are combined weighted by their respective elasticity of output. The above result is implied by a Cobb-Douglas production function of the following:

$$Q = A_o e^{mt} L^a K^b \qquad (10)$$

where Q= output, L= labour input, K= capital input, m= proportionate change of Hick's neutral disembodied technical progress, A_o = initial efficiency parameter, t= time and a and b are partial elasticity of output with respect to L and K respectively (a and b are non-negative).

Also from equation (5), assuming a neutral technical progress, time can be factored out in order to write it as:

$$Q = A(t)\, F[K,L] \qquad (11)$$

A(t) measures the cumulative effect of shifts over time (see Solow, 1957:312). And it is easy to arrive at:

$$\frac{dQ}{Q} = \frac{dA}{A} + a\frac{dL}{L} + b\frac{dK}{K} \qquad (12)$$

where a and b are the relative shares of capital and labour. If one takes the total differential of equation (11) with respect to time, it will be:

$$\frac{dQ}{dt} = \frac{dA}{dt}F(k,L) + A\frac{\partial F}{\partial L}\frac{dL}{dt} + A\frac{\partial F}{\partial K}\frac{dK}{dt} \tag{13}$$

If Q divides the whole expression, it turns out to be:

$$\frac{1}{Q}\frac{dQ}{dt} = \frac{1}{Q}\frac{dA}{dt}F(k,L) + \frac{A}{Q}\frac{\partial F}{\partial L}\frac{dL}{dt} + \frac{A}{Q}\frac{\partial F}{\partial K}\frac{dK}{dt} \tag{14}$$

After simplifying the first term of the right side expression, it will take the form:

$$\frac{1}{Q}\frac{dQ}{dt} = \frac{dA}{Adt} + \frac{A}{Q}\frac{\partial F}{\partial L}\frac{dL}{dt} + \frac{A}{Q}\frac{\partial F}{\partial K}\frac{dK}{dt} \tag{15}$$

Since

$$A\frac{\partial F}{\partial L} = \frac{\partial Q}{\partial L} \tag{16}$$

and

$$A\frac{\partial F}{\partial K} = \frac{\partial Q}{\partial K} \tag{17}$$

Assuming dt = 1, equation (15) will be:

$$\frac{dQ}{Q} = \frac{dA}{A} + \frac{\partial Q}{\partial L}\frac{dL}{Q} + \frac{\partial Q}{\partial K}\frac{dK}{Q} \tag{18}$$

Multiplying the last two terms by L/L and K/K, respectively, the expression will take the form:

$$\frac{dQ}{Q} = \frac{dA}{A} + \frac{\partial Q}{\partial L}\frac{L}{Q}\frac{dL}{L} + \frac{\partial Q}{\partial K}\frac{k}{Q}\frac{dK}{K} \tag{19}$$

Defining a and b to be labour and capital elasticity of output, respectively, i.e.,

$$a = \frac{\partial Q}{\partial L}\frac{L}{Q} \tag{20}$$

and

$$b = \frac{\partial Q}{\partial K}\frac{K}{Q} \tag{21}$$

through substitution one can arrive at equation 9 and 12.

If Cobb-Douglas technology does not characterise the production process, other functional forms such as Constant Elasticity Substitution (CES) technology or Translog technology could be used and one would reach at the same result. It requires only transforming the efficiency parameter as an increasing function of time. In this case, technical progress can be introduced in the CES technology as follows:

$$Q = \gamma_o e^{mt}[\delta K^{-\rho} + (1-\delta)L^{-\rho}]^{-\frac{\nu}{\rho}} \tag{22}$$

In the Translog technology, it will take the form:

$$LnQ_t = \mathrm{Ln}\gamma_o + mt + \alpha_1 LnL + \beta_1 LnK + \alpha_2 (LnL)^2 + \beta_2 (LnK)^2 + \gamma_1 LnL\,LnK \tag{23}$$

m represents Hicks neutral disembodied technical progress.

3. NATURE OF TECHNICAL PROGRESS

Technical progress has various prefixes: exogenous, endogenous, disembodied, embodied, neutral, labour or capital saving depending on its impact on factor productivity and its sources and carriers. Embodiment is an issue of vintage as a carrier of technological progress, giving different weights to different vintage of technology.

Neutrality is an issue of whether technical progress causes an equi-proportionate rise of factor inputs' efficiency. There is Hicks neutrality, Harrod neutrality or Solow neutrality; their difference lies on whether technological progress leaves factor ratios unchanged (Hicks), capital-output ratio unchanged (Harrod), labour-output ratio unchanged (Solow) for given factor prices (Heathfield & Wibe, 1987:121).

3.1. Non-Neutral Technical Progress

There is a method for identifying whether technical progress is neutral or not. A simple way is to measure factor inputs in their efficiency units (Heathfield & Wibe, 1987:123). As time passes and experience is gained each man-hour becomes more efficient. Capital input as well, especially through replacement investment embodies new technology, which is more efficient. Factor inputs in production should, as a result, be measured in their efficiency in order to identify whether technical progress is capital or labour saving. This requires a general Cobb-Douglas production function of the form

$$Q = A\,[L(t)]^a\,[K(t)]^b \tag{24}$$

where K(t) and L(t) represent capital and labour inputs in their efficiency units. The basic assumption here is that as time passes, their efficiency increases. To make it specific, let

$$K(t) = e^{nt}K_e \tag{25}$$

and

$$L(t) = e^{vt}L_e \tag{26}$$

where K_e = actual capital input, K= capital input in efficiency unit, L_e = actual labour input, L = labour input in efficiency units, n and v are rates of growth of efficiency per unit of time.

Through substitution, equation (24) turns out to be:

$$Q_t = Ae^{avt}e^{bnt}L_e^a K_e^b \tag{27}$$

or

$$Q_t = Ae^{(av+bn)t}L_e^a K_e^b \tag{28}$$

If n = v, technical progress is Hicks neutral; it raises efficiency of factor inputs at the same proportion If n = 0, it is Harrod neutral and technical progress is labour saving; and if v = 0, it is Solow neutral implying that technical progress is capital saving. If there is a need to use CES or Translog technology, the mechanism will be the same - using factor inputs in their efficiency unit. This method of estimation is not employed in this paper for lack of easy estimation techniques.

Another method is that of Katz. Katz (1969: 97-99) used CES technology of the following form:

$$Y = [(E_L L)^{-\rho} + (E_K K)^{-\rho}]^{-\frac{1}{\rho}} \tag{29}$$

where $E_L L$ and $E_K K$ constitute, respectively, the inputs of labour and capital in "efficiency units"; L and K being conventional measures of such inputs. It assumes constant returns to scale. Changes in E_L and E_K through time are considered as "labour-augmenting" and "capital-augmenting", respectively. Least cost efficient input use in production requires the condition (assuming perfect factor and product market):

$$\frac{w}{r} = \frac{E_L^{\rho}(Y/L)^{(1+\rho)}}{E_K^{\rho}(Y/K)^{(1+\rho)}} \tag{30}$$

Solving for K/L, equation (30) will take the form:

$$\frac{K}{L} = \left(\frac{w}{r}\right)^{\sigma}\left(\frac{E_L}{E_K}\right)^{(1-\sigma)} \tag{31}$$

Multiplying both side by $(L/k)^{\sigma}$ yields:

$$\frac{K}{L}\left(\frac{L}{K}\right)^{\sigma} = \left(\frac{w}{r}\frac{L}{K}\right)^{\sigma}\left(\frac{E_L}{E_K}\right)^{(1-\sigma)} \tag{32}$$

Labelling π_L and π_K as the shares of labour and capital, respectively, and solving for K/L, equation (32) can be written as follows:

$$\frac{K}{L} = \left(\frac{wL}{rK}\right)^{\left(\frac{\sigma}{1-\sigma}\right)}\left(\frac{E_L}{E_K}\right) = \left(\frac{\pi_L}{\pi_K}\right)^{\left(\frac{\sigma}{1-\sigma}\right)}\left(\frac{E_L}{E_K}\right) \tag{33}$$

Assuming that changes in E_L/E_K, the relative efficiency of labour, take place at a constant geometric rate $(\Sigma_L - \Sigma_K)$, where Σ_L and Σ_K are the respective constant geometric rate of growth of the efficiency of labour and capital, then:

$$\frac{E_L}{E_K} = A_o \exp(\varepsilon_L - \varepsilon_K)t \tag{34}$$

where $A_0 = E_L(0)/E_K(0)$ which represents the relative efficiency of labour at the base period. Substituting equation (34) for equation (33) yields a regression model in logarithmic form, which can be written as follows:

$$\text{Log}\frac{K}{L} = A_o + \frac{\sigma}{(1+\sigma)}\text{Log}\,\pi + (\varepsilon_L - \varepsilon_K)t \qquad (35)$$

Equation (35) can be fitted by OLS to aggregate data on capital, labour and relative factor shares for the manufacturing sector to identify whether technical progress is non-neutral and whether it is biased to labour or to capital. Katz (1968:108) employed this method on the Argentine manufacturing sector and found out that it was labour saving. The efficiency of labour grew at a rate which was 1.6 to 1.7% higher than the rate at which the efficiency of capital grew though time.

Another method, which does not limit the extent of substitution or returns to scale is the augmented Translog production function. Treating time as the variable that captures technical progress, Translog technology of the following form can be used

$$lnY = lnA_o + a_1 t + a_2 t^2 + \sum b_i LnX_i + 0.5\sum\sum b_{ij}\,\text{Ln}\,X_i\,\text{Ln}\,Y_j + c_i t\,lnX_i + u \qquad (36)$$

where Y= output, t= time, x= inputs (labour and capital) and $b_{ij} = b_{ji}$. This specification allows the calculation of the rate of technical progress.

$$\frac{\partial lnY}{\partial t} = a_1 + 2a_2 t + \sum c_i lnX_i \qquad (37)$$

which incorporates both the effect of disembodied technical progress (a_1 and a_2) and the effect of any bias in technical change on the use of each of the factor inputs (c_i). The c_i coefficient indicates the extent to which technical change is biased towards the particular factor input. That is, technical progress is factor i-using, i-neutral or i-saving if the estimate of c_i is positive, zero or negative, respectively. The last two approaches are utilised in this paper using aggregate and longitudinal data.

3.2. Embodied Technical Progress

Embodiment is an issue of finding out whether the recent capital and labour inputs acquire the latest technology which should also have a better quality. In this regard, Hildebrand and Liu (1965:49-52) tried to devise some proxy or dummy variables that would reflect changing technology to a significant extent. They assumed that important change in the level of technology could not take place without being reflected in the following:

- a change in the ratio of the value of equipment to the value of plant;

- a change in the average age of the capital assets as expressed in the ratio of the net value of assets to that of the gross value; and

- a change in the ratio of technical and professional personnel to production workers.

They proposed a Cobb-Douglas production function, which enables to incorporate technology explicitly as a variable of the following type:

$$Q = AL^{(a \log r)} K^{(b \log R)} \qquad (38)$$

where r = the ratio of technical personnel to production workers and R= the ratio of equipment to plant or the ratio of net value to gross value of capital assets. In this setting, factor-output elasticity or factor ratios will not remain constant overtime since the exponents are (a log r) and (b log R).

For a given level of technology, r and R are constant, and therefore the exponents are also constant. In this case, changes in quantities of labour and capital inputs would result in changes in output along a given production surface (Hildebrand & liu, 1965:50). Shifts in production would take place as the exponents themselves change when the technological level (or the level of mastering and adapting technology and learning-by-doing) itself undergoes changes, modifying the original surface. The exponents will change only if r and R change; and they would only change, in normal cases, if there were a change in the level of technology itself or in the use of technology.

Solow and Intriligator (Intriligator, 1978:291) had estimated embodied technical progress using vintage model. Intriligator estimated a production function incorporating both embodied and disembodied technical progress for aggregate US manufacturing output for the period 1929-1958. According to this estimate, disembodied technical progress was 1.67 percent per annum and technical progress embodied in capital amounts to on average 4 percent annually (Intriligator, 1978:292). Hildebrand and Liu (1965:58-62), using equation (38), tried to incorporate technological change in the production function and attempted to identify the capital-output elasticity and technology-output elasticity for the three digit industries of USA; and their result showed that technical progress was, by and large, capital embodied. To identify whether or not technical progress is embodied in labour or capital, equation (38) is employed in this paper. r and R are used as a proxy measure to capture technological change.

r is taken to be the ratio of labour cost of non-production workers to production workers in percent. Payment to non-production workers is assumed to represent payment to technical and professional personnel, who have more relation with the extent of technology utilisation than production (or manual) workers. The problem here is that payment to non-production workers might not be a good representation of technical and professional personnel. It would have an upward bias as the former includes other payments. Furthermore, payment to production workers heavily correlates with the extent of capacity utilisation. If capacity utilisation falls for whatever reason, there will be a tendency to reduce, at least, temporary manual workers.

R is the ratio of the value of equipment (machinery, tools, etc.,) and the value of the plant (structures, buildings, etc.,) which indicates the extent of "technological intensity". The problem here is the way the plant and equipment are assumed to depreciate. The rate at which equipment is assumed to depreciate is quicker than that of the plant which leads R to vary without any implication on technology. Had it not been for lack of data on gross fixed asset, the "average age" of the capital assets would have been preferable.

3.3. Data Source and Measurement

Measuring technical progress has not only conceptual but also measurement problems, especially on measuring output and factor inputs. Which output (gross or net), labour (man-year or man-hour), and capital (net or gross) reasonably reflect the productive content of inputs?

Net or Gross Output? Due to its heterogeneous nature and difficulty of aggregation, measuring output physically is hardly possible even at an enterprise level. Furthermore, physical output as a measure of 'production' does not take account of the difference between the quality of the two products; nor does it take into account the work done to achieve the improvement in quality (Silver, 1984:38). Thus, it becomes customary to focus on value measures; the issue again is which value to use - gross or net?

To measure technical progress properly, output should avoid double counting if figures are to be aggregated and should include additional works done on intermediate inputs while excluding works done by others. Output which excludes brought-in materials, double counting and includes additional works becomes net output (value-added).

In this paper, output will therefore be measured by value-added in national account concept at factor cost. The source of data is CSO/CSA which contains dis-aggregated data up to four-digit industries for 25 years.

Man-year or Man-hour? Which concept of labour input measures the productive content of labour is an issue. Is it the stock available for use in production (Man-year)? Is it the time in which stocks are available for production (man-hour)? Is it the compensation to the flow of services (wages)? There appears to be no conclusive prescription.

Labour input can be measured in man-year. But, man-year may not be a satisfactory measure of the number of persons working over the whole year. Such data only records the number of persons employed on the census day or during a short reference period of one or two weeks, which might ignore inter-seasonal variations. It is a weak approximation if employment is highly seasonal or irregular or when uneven changes have taken place during the year (Mabro & Radwan, 1976:137-138). Silver proposes a monthly or quarterly count of workers; "the more frequent the count, the more appropriate is the resulting average for purpose of calculating productivity" (Silver, 1984:90).

However, due to many factors including incidence of absenteeism and sickness, change in the number of overtime workers, change in proportions of full time and part-time workers man-year is not a good measure of labour inputs in production the number of hours worked may differ among firms and vary from period to period (Mabro and Radwan, 1976:138). They therefore propose to utilise man-hour. Even then, would the productive content of an hour of labour be identical so that labour will be a simple addition? The answer does not seem to be in the affirmative. Differences among labour in sex, age, ability, education, training, experience, devotion, etc., would be inevitable. Thus, the productive content of an hour of labour will not be identical, and a simple addition of man-hour disguises the heterogeneous nature of labour.

To make labour homogeneous, different approaches have been forwarded, like treating skills as a stock of intangible assets (Mabro and Radwan, 1976) or weighing man-hour of different categories of a labour force by their average earnings.

In this paper, wage is used as a measure of labour input because it is the simplest mechanism available to make labour homogenous. Data source is CSO/CSA.

Which capital? A converging idea on measuring capital in production had never been reached. Solow, stressing on the measurement problem, says "the capital time series is the one that will really drive a purist mad" (Solow, 1957:314). Capital input in production is measured through estimate aided by some proxies. The proxy measures are still debatable.

One area of controversy is its coverage. There is no agreement on it. The coverage extends as wide as 'all human and man-made assets' and as narrow as only 'machinery'.

Another controversy is on the valuation of capital stock. Walters states that:

> *...the most intractable difficulties are involved in measuring capital. In a mythical world where all machines are the same overtime, the ideal measure would appear to be the number of homogeneous machines.... The main difficulties... arise from the fact that the stock consists of various kinds of machines, buildings and land at different stages of their life cycles. Combining these into a monetary measure involves not only all these social index number problems but also difficulties, which are peculiar to capital (Walters, 1963:23).*

Indeed, to aggregate a heterogeneous stock of capital requires the knowledge of the price of each item: "... the unit of measurement varies with rate of profit; the relative prices of equipment are determined by future profit expectations" (Walters, 1963:23).

In most empirical studies, as Mabro and Radwan pointed out, cost provides the basis of valuations. The normal procedure is to measure capital value through perpetual inventory system and then deflate it by price index. Another alternative is valuation at current prices, which includes:

> *... First, collecting the valuation for fire insurance, second, multiplying valuations for estate or inheritance duties by the reciprocal of suitable specific normality rates, and third, multiplying the property income stream by reciprocal of the estimated rate of return...(Walters, 1963:24)*

The choice to utilize anyone of these depends mainly on the weights given to quality and cost changes and on data availability.

Another debatable issue is the question of whether changes in capital inputs are proportional to changes in the gross or the net capital stock. There are some (Walters, Mabro and Radwan) who prefer to use gross capital input; their main argument being that a machine or a building does not decline over time in the way implied by the usual depreciation methods. They also note that net stock suffers from the arbitrariness involved in the concept of depreciation (Mabro and Radwan, 1976:152).

On the other hand, those who argue for net capital stock hold the view that capital input is proportional not to gross but to net value. For instance, Silver (1984: 127) states that the value of capital stock in any period is given by the value in an initial period plus additions to and subtractions from the stock in each respective period. Kendrick argues for net capital as follows:

> *Real stocks net of accumulated depreciation allowances are taken as a better measure of a basic capacity to contribute to production than gross stocks... Studies have shown that the gross output capacity of various types of machinery tends to fall with age, and the repair and maintenance charges rise so that the contribution to net revenue product of groups of items over time is roughly approximated by the gradual decline in the depreciated real value of stock shown by the usual depreciation accounting procedures reflected in the national accounts (Kendrick, 1982:35)*

The choice between gross or net capital varies according to weights given to each factor. In this paper, net fixed asset is employed due to lack of data.

Issues on Inflation: The main source of data is "the Results of Surveys of Manufacturing and Electricity Industries" published by the Central Statistical Authority in various years (1976-2000). But data in these documents are at current prices. When value-added, wages and fixed assets are employed in this paper, it is on the understanding that they reflect concept of quantity. Value reflects quantity if the effect of price is removed. This can be done by converting nominal values into real ones by using a deflator. In this paper, however, inflation is not taken into account because of strong convictions that proxy-deflating mechanisms distort results worse than price movements in the context of the Ethiopian manufacturing sector.

Deflating using consumer price index would not be appropriate when output is value-added at factor cost. Prices in the manufacturing sector (which are dominantly public) were regulated and even if there were some price adjustments, it was mainly to counterbalance increments in intermediate costs and indirect taxes. Thus, when taxes and intermediate inputs are excluded, the fear of price fluctuation would be minimised.

Value-added increment that arise from average wage increments would not necessarily be ascribed to inflation; average wage should increase overtime to capture the ever-increasing quality of labour. Profit was deliberately undermined since output prices were usually fixed for a long time (at least pre 1991) while intermediate inputs (mostly imported) were subject to price effect.

3.4. Results

Equation (35) is run using OLS. Relative factor share (π) is the ratio of labour to capital share (π_L/π_K). Capital-labour ratio is net fixed asset per unit of labour cost. The estimation is made using both aggregate data (which assume homogeneity among sub-sectors) and using longitudinal data. For the aggregate data which is

mainly a time series, regression with Newey-West standard errors is used (in built in STATA 7) since it assumes that the error structure could be heteroscedastic and autocorrelated with lags. The result is reported in Table 2a.

Table 2a: Aggregate data: Regression with Newey-West Standard Errors of Equation (35)

REGRESSORS	COEFFICIENTS	T-RATIO	P VALUE	F-RATIO	LAG
- Con	0.5784	3.53	0.034	9.94	22
- T	0.0451	4.28	0.000		
- Ln(π)	-0.1043	-2.26	0.002		

For the disaggregate data which is mainly a cross-sectional time series, regression with panel corrected standard errors (PCSE) is used (in built in STATA 7) since it assumes that the disturbances could be heteroscedastic and contemporaneously correlated across panels. The result is reported in Table 2b.

Table 2b: Panel data: Prais-Winsten Regression of Equation (35) with PSCE

REGRESSORS	COEFFICIENTS	Z-RATIO	P VALUE	WALD-RATIO
- Con	0.7120	3.62	0.000	8.6
- T	0.0263	2.23	0.026	
- Ln(π)	-0.0702	-1.95	0.051	

From the table, it is clearly seen that the significance of the coefficients as well as the signs remain consistent when one uses aggregate and panel data sets. But there is a difference in the size of the coefficients. While the coefficient for π is -0.07 in the case of panel data, it is -0.10 in the case of aggregate data. The reverse is true for size of the coefficient of T. It is only 0.0263 in the case of the panel data while it is about 0.0451 for the aggregate data.

Model (36) is run by OLS following the same line as that of Model (35) using both aggregate and panel data. The result of the regression with Newey-West Standard Errors is reported in Table 3.

Table 3a: Aggregate Data: Regression with Newey-West Standard Errors of Equation (36)

Regressors	Coefficients	T-ratio	P-value	F-ratio	Lag
- Con	-1021.8	-4.76	0.000	3132.4	10
- T	-15.42	-9.07	0.000		
- T^2	-0.0569	-7.90	0.000		
- LnW	137.45	4.91	0.000		
- LnK	38.78	1.91	0.076		
- LnW^2	-5.63	-4.90	0.000		
- LnK^2	-1.362	-2.77	0.014		
- LnW*LnK	-0.511	-0.28	0.784		
- T*LNW	0.9248	8.52	0.000		
- T*LNK	0.3853	2.85	0.012		

The result of Prais-Winsten Regression of Equation (35) with panel corrected standard errors for the cross-sectional time series data (19 sub-sectors with 25 year of observations, excluding those with negative value-added observations) is reported in Table 3b.

Estimate of coefficients on aggregate data and panel data are dissimilar both in size and sign in most cases. For example, while the coefficient of LnW is 137 in the case of aggregate data, it is only 0.21 in the case of the panel data set. The same is true with respect to sign. While the sign is positive in the case of aggregate (the coefficient for T*LnW), it is negative in the case of panel and the reverse is true for the coefficient of T^2 Surprisingly, most of the coefficients in the case of the aggregate data set are statistically significant at 10 percent significance level. It is only the coefficient for capital which is insignificant.

Table 3b: Panel Data: Prais-Winsten Regression of Equation (35) with PSCE

Regressors	Coefficients	Z-ratio	P-value	Wald-value
- Con	3.466	1.51	0.131	498.1
- T	0.103	1.53	0.127	
- T^2	0.023	1.93	0.054	
- LnW	0.210	0.35	0.728	
- LnK	0.173	0.42	0.672	
- LnW^2	-0.025	-0.37	0.712	
- LnK^2	-0.063	-2.11	0.035	
- LnW*LnK	0.125	1.64	0.102	
- T*LNW	-0.014	-1.08	0.278	
- T*LNK	-0.002	-0.24	0.809	

With regard to embodiment, equation (38) is run using both aggregate and panel data. Different alternatives are also assumed regarding the carriers of technical progress; technical progress is embodied in labour, capital or in both labour and capital but at different rates. The result of the estimate using aggregate data with the same technique as that of the above is reported in Table 4a.

Table 4a: Aggregate Data: Regression with Newey-West Standard Errors of Equation (38)

Regressors	Coefficients	T-ratio	P value	F-ratio	Lag
- Log r log W	0.0438	0.78	0.444	11.24	10
- log R log K	0.0995	4.34	0.000		
- con	13.794	48.63	0.000		
- log W	0.9556	5.71	0.000	38.14	20
- log R log K	0.03306	4.20	0.000		
- con	1.57521	0.73	0.472		
- Log r log W	-0.1692	-4.66	0.000	186.61	12
- log K	0.88248	9.59	0.000		
- con	0.68909	0.48	0.637		

The result of Prais-Winsten Regression of Equation (38) with panel corrected standard errors for the cross-sectional time series data (19 sub-sectors with 22 year of observations, excluding those with negative value-added observations and deviant observations) is reported in Table 4b.

Table 4b: Prais-Winsten Regression of Equation (38) with PSCE

Regressors	Coefficients	T-ratio	P-value	Wald-value
- Log r log W	-0.00131	-0.28	0.777	0.22
- log R log K	0.00160	0.40	0.691	
- con	9.4808	59.72	0.000	
- log W	0.94461	21.87	0.000	478.47
- log R log K	0.00447	1.47	0.143	
- con	1.40955	3.66	0.000	
- Log r log W	-0.00141	-0.28	0.779	45.79
- log K	0.25189	6.76	0.000	
- con	7.3066	19.86	0.000	

As one can see in Table 4, relevant coefficients are either not statistically significant (the case of log r log W and log R log K in the case of panel) or theoretically meaningful (the negative value for log r log W). Those coefficients which are statistically significant in some of the specifications are near to zero. In fact, there appears no significant reason to choose one from the other. This could mainly be because of the fact that there was no technical progress registered by the manufacturing sector for the last two and half decades. In fact, if we look into the trends of total factor productivity (the ratio of value-added in the national account concept at factor cost and the combined factor inputs – labour and capital – with their respective factor income shares) for the last twenty five years, it was declining, indicating the absence of technical progress in the sector.

Table 5: Total Factor Productivity using different factor shares and labour input

Year	Case 1	Case 2
1975/76	1.1569	1.0836
1976/77	1.3046	1.2070
1977/78	1.5407	1.4135
1978/79	1.8368	1.6570
1979/80	2.2049	1.9648
1980/81	2.0958	1.8735
1981/82	1.9800	1.7505
1982/83	1.9287	1.6870
1983/84	1.9533	1.7054
1984/85	1.3020	1.1734
1985/86	1.4760	1.3170
1986/87	1.5473	1.3808
1987/88	1.4309	1.2543
1988/89	1.5981	1.3971
1989/90	0.9450	0.8444
1990/91	0.6830	0.6228
1991/92	0.5035	0.4557
1992/93	0.8081	0.7324
1993/94	0.9962	0.9117
1994/95	1.1478	1.0410
1995/96	1.0763	0.9887
1996/97	0.9415	0.8722
1997/98	0.7531	0.7018
1998/99	0.7239	0.6831
1999/00	0.6907	0.6555
Growth	-4.037%	-3.909%

Source: own computation.
Labour input is represented by man-year (Case1) and wage bill (Case 2) in the computation of total factor productivity.

In summary, the nature of technical progress using the above approaches becomes unclear. It tends to vary on the methodology and the data set utilised, as one can see from Table 6. Table 6 is constructed by looking into the significance of the coefficients, which contains information about the nature of technical progress regardless of the significance of others. The significance of the model as a whole is, however, a pre-condition.

Table 6: Nature of Technical Progress

Models	Data set	
	Aggregate	Panel
Equation 34	L-saving	Labour-saving
Equation 35	L- and K-using	Stat. insignificant
Equation 37	Unfit	Unfit

The coefficient for T in equation (35) is positive (0.0451) and significant at 5% level using aggregate data implying that labour efficiency is 4.51% higher than capital, which indicates labour-saving nature of technical progress. It is also positive in the case of panel data and significantly different from zero indicating labour saving nature of technical progress. In the case of equation (36), the coefficients for T*LnW and T*lnK using aggregate data are positive indicating both labour and capital consuming nature of the production system of the Ethiopian manufacturing sector. For panel data, however, the coefficients for both become insignificant though the sign for the former changes to negative. Regarding equation (38), there is no indication as such.

The result summarised in Table 6 indicates that the production process of the Ethiopian manufacturing sector seems more of labour saving and frequently factor input using. In fact when we look into the source of manufacturing output growth in Table 7, the contribution of total factor productivity to output growth is negative.

Table 7: Source of manufacturing output growth for 1975/76 – 1999/00

Items		1976-1990	1993-2000	1976-2000
Growth in %	Labour	7.23%	6.67%	6.44%
	Capital	8.06%	18.66%	10.91%
	Output	5.12%	14.50%	6.43%
Factor Share	Labour	34.91%	32.07%	34.56%
	Capital	65.09%	67.93%	65.44%
Contribution to Growth	Labour	42.0%	15.70%	35.68%
	Capital	87.29%	94.83%	108.69%
	TFP	-29.29%	-10.52%	-44.38%

Source: own computation.

Much of the output growth emanates from capital. In fact, the output growth could not compensate the capital consumed. Such labour and capital wasting nature of the production process of the Ethiopian manufacturing sector is a sign of danger consuming its competitiveness in the global market. With such type of production technique, globalisation will be a great threat to Ethiopia.

3. CONCLUSION AND POLICY IMPLICATION

The conclusion and policy implication to be drawn, however, need some caveats, at least, in two respects. First, the study is based on neoclassical models and second its database assumes some level of aggregation. Neoclassical models usually use strict and stringent assumptions like production function, profit maximization, perfect competition, free and immediate access to information and zero transaction costs. All these assumptions are nearly untenable in the Ethiopian context. Hence, the conclusion arrived at and the implication to be drawn from such a setting might be erroneous. Secondly, the methodology employed assumes learning as a simple function of time, whereas case studies proved that a process of technical progress does not proceed at a constant rhythm (Herbert-Copley, 1990: 1460). Furthermore, the way technical progress is computed does not entertain quality improvement, productivity increase in intermediate input and fluctuations in capacity utilization for factors beyond the control of firms. Besides, technical change is measured by its impact on productivity not by its absence from or presence on the hardware or software side of production. Technical progress might occur without a significant impact on productivity. Thirdly, the results arrived at and the implications rest on aggregate data (data are collected at three-digit industry level). But the process of technical progress across firms will not be unidirectional, which is assumed by the out come of this paper. Heterogeneity is certain and generalization without due consideration to firm-specific characters might be misleading.

Given these caveats, one point is clearly observed in this study. The production technology in general was resource consuming and labour saving contrary to the theory of initial factor endowments of the country. This implies that adaptation of technology (as defined in the beginning) was not appropriate to the prevailing conditions of Ethiopia. This in turn implies that enterprises in Ethiopia lack the capability for technological acquisition, which leads to the conclusion that if Ethiopia has to industrialise, manufacturing enterprises have to build the necessary technological capabilities (production, investment and innovation capabilities) and the government has to provide the necessary incentives and develop the required institutions.

The premise here is that "technological knowledge is not shared equally among firms, nor is it easily imitated by or transferred across firms. Transfer necessarily requires learning" (Lall, 1992:160). As a result, acquiring technological knowledge requires firstly experience in production and secondly investment on education and those firms with these elements produce the required capability. Raut says, " ... while knowledge from private R & D capital spills over to create public domain knowledge, a firm must invest in private R & D to acquire the technical capability needed to make use of the public domain knowledge to enhance productivity" (Raut, 1995: 2). Utilising public domain knowledge fruitfully has costs, but the costs will be minimal for those firms

which have accumulated the stock of technological knowledge through considerable investment in R & D in the past (Raut, 1995).

Such task is the deliberate effort of the firm to adapt technology to new conditions, to improve it slightly or significantly, and this process might pass through three stages of capability: Production, investment and innovation (Lall, 1992; Dahlman and Westphal, 1987). Production capability includes production management - ability to oversee and improve operations; production engineering - ability to obtain information (about systems of raw material control, production scheduling, quality control) and action to optimise operations; trouble-shooting to overcome problems and adapting process and products to increase productivity; repair and maintenance of physical capital. These capabilities can be gained from gathering and interpreting information from the production system, attempting adaptations and modifications, examining why some work and others do not, and from keeping records to preserve such information. This requires continuous and systematic efforts as well as resources; it cannot just happen when shocked by changes in inputs or production markets. The process may take up to 20 years to acquire its full range (Dahlman and Westphal, 1987: 764-765; Lall, 1992: 168-169).

Investment capabilities include the skills needed to identify, prepare and obtain technology as well as to design, construct, equip, staff and commission an expansion which determines the capital cost, the appropriateness of the scale, the product mix, technology and equipment selection which in turn affects the efficiency with which it will operate (Lall, 1992:168). Innovation capability consists of major and minor innovations including improvements in existing technology. Acquiring the first two capabilities referred to above is the main impetus to develop some capabilities in innovation. These capabilities are important for diversification and change and every firm has to give due consideration to efforts to attain these capabilities. A firm that fails to achieve these capabilities will fail to survive. Lall argues

> *if a firm is unable by itself to decide on its investment plans or selection of equipment, process, or to reach minimum levels of operating efficiency, quality control, equipment maintenance or cost improvement, or to adapt its product designs to changing market condition, or to establish effective linkages with reliable supplies, it is* ***unlikely*** *to be able to compete effectively in open markets (Lall, 1992: 168)*

The pace of acquiring these capabilities by firms depends on the level of development the economy has attained, physical and human capital development, national technological efforts, incentives, institutions and government policies, which are not the domain of individual firms.

Firm level technical capabilities can be acquired, however, only if there are sufficient entrepreneurial capabilities, with industrial experiences, proper incentives and

adequate institutions. The government has to provide all these sufficiently. They include the launching of physical investment, the provision of human capital and the promotion of technology. Lall reported that "these three are strongly inter-linked in ways that make it difficult to identify their separate contributions to national performance, but they do not always go together" (Lall, 1992:170). One without the other will not exert a sufficient impact, or the existence of one does not necessarily bring the existence of the other.

Physical investment (plants and equipment) is a pre-requisite for industry to exist. The undertaking of physical investment in Ethiopia was hindered by lack of domestic investment capabilities, which in turn is caused by lack of entrepreneurial capability. Strong private sector participation and experience in industrial activities are important to develop entrepreneurial capabilities.

The size of the informal sector in Ethiopia might give an impression that there is no shortage of entrepreneurial drive. But the drive to make profit from opportunities might not *per se* be the same as the entrepreneurial capability required to set up, organise, and run a modern industry, which requires larger scales, longer time perspectives, more advanced technologies and more complex organisations than traditional crafts or informal sector activities (Lall, 1992: 116). They rather favour rent seeking and trade activities, which produces quick returns. The private sector was also stifled by wrong economic policies for about two decades that impede it to produce its impact on physical investment.

Now Ethiopia has started moving in the right direction, but more efforts should be made by the government to increase the participation of the private sector (not necessarily through privatisation) and the process of learning entrepreneurial capabilities. This entails commitment beyond creating an enabling environment, especially in identifying basic barriers to industrial entrepreneurial capability and initiating selective intervention on industrial activities. Protection of selected manufacturing enterprises, promoting efforts of industrial enterprises to acquire technological development, subsidising firm level research and development are a few important areas that the government has to look into in the Ethiopian context.

Regarding protection, the government of Ethiopia has made trade policy reforms. The reforms have reduced the extent of protection in most firms; and inter-firm variations of protection rates have decreased. Most enterprises are exposed to competition both from domestic production (by encouraging private investment which was stifled in the past deliberately) and imports (by liberalizing trade). The move could be in the right direction but looks too general and indeterminate. Quoting Lall (1992: 125) here is appropriate.

> *Given the inherent costs and duration involved in building up capabilities in new, complex industrial activities, and given the differences between technologies, there is no reason to argue that all industries should be protected equally... More difficult technologies call for higher protection, and activities, which have high linkages with others, call for broader protection to embrace related industries, which are also undergoing learning. Similarly, activities that generate higher externalities need more support because investors cannot appropriate all the benefits.*

Competition is necessary but it is a double-edged weapon. Too much competition can wipe out firms that cannot finance the costs of capability acquisition. In view of this, the reforms in Ethiopia must be selective and gradual.

Another important factor that government should focus upon has to be on education and training. The primary importance of education is its impact on the development of entrepreneurial capability; a person with high level formal education is better placed to adapt, understand, learn, use and create ideas. Entering into more demanding activity call for high level technical specialisation in education. The quality of education and its technical orientation (vocational training) which Ethiopia currently lacks are quite important. Firm level training is crucial and efforts made at the firm level to create skills and train workers could make a difference on total factor productivity but firms usually are reluctant to invest on training. Regarding the importance of in-firm training and the role of government in providing it, Lall says:

> *Since there is a serious risk of private under-investment in training at the firm level when labour is mobile, human capital development requires measures to induce more investment to support employee training, by firms individually or collectively, or by governments where private agents consistently under-invests. These measures may be functional, applied to all activities, or they may be selective, targeting emerging sectors (Lall, 1992:181).*

Even if labour is trained and physical investment is made, these will only be productive when combined with efforts made by the government to promote technology and to guide firm level endeavours.

Industrial institutions should also be created to promote inter-firm linkages in production, technology or training, to provide support to smaller enterprises, to help firms restructure and update. It is further necessary to have technological institutions to remedy market failures especially in the area of information on sources of

technology since technological information does not exist everywhere, nor are the international markets of technology competitive.

There are no institutions in Ethiopia set up to supply information about technology or markets while selecting appropriate technology. Acquiring technology that is easy to adapt, assimilate and change to local conditions depends on information and the ability to use that information effectively. Because information is a public good and is characterized by large economies of scale in collecting and organizing, the private actors under invest on it since they cannot appropriate all the benefits of their efforts. This justifies the need for the government to subsidize the collection and dissemination of technological information to provide it and provide to those in need at affordable charges.

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LAND TENURE AND LAND MANAGEMENT IN THE HIGHLANDS OF NORTHERN ETHIOPIA*

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Abstract

Land tenure security is important to encourage investment in land improvements as well as the development of efficient land markets. In Ethiopia, empirical analysis is required to find out the effect of the current land tenure system on farmers' propensity to invest in land improvements, and the development and functioning of land markets. Data collected from 50 communities in the highlands of Tigray in 1998 was used to investigate the functioning of land markets, and determine the relationship between perceived land tenure security and land investments in the region. We found out that informal land markets (sharecropping and fixed rental) are emerging in the region, and while quality of land is an important determinant of rental price in fixed lease, quality appears to play limited role in determining the land holder's share in sharecropping. Landlessness is increasing in the region. Perceived tenure security is important for making land investments and use of improved farming practice. However, investments in land do not appear to have significant effect on perceived tenure security of farmers. Our results imply that there is a need to improve tenure security of farmers in order to encourage land investment. The role of public policy in facilitating the development of the fledgling land markets needs to be explored. The wishes and preferences of farmers regarding land tenure arrangements and land administration should be considered as crucial inputs to future land tenure arrangements. Moreover, an open, concerted and inclusive debate on the relevance and feasibility of alternative land tenure arrangements for the country or for different parts of the country needs to be encouraged. Alternative tenure arrangements need to be evaluated based on the level of security they provide to farmers, since tenure security is more important than the mode of ownership.

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* The final version of this article was submitted in June 2003.

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1. INTRODUCTION

Significant improvements in agricultural productivity are crucial to address the worsening conditions of poverty and food security in sub-Saharan Africa (Omiti et al., 2000). In Ethiopia, improvement in land productivity is vital to enhance and sustain the welfare of the largely agrarian population (World Bank, 1989). The traditional land use and land management practices that used to sustain the welfare of human population under low population pressure with little or no technical inputs can no longer able to support the growing population. Per capita food production declines due to increasing population density and degradation of the natural resource base which results in deteriorating human welfare conditions.

In Ethiopia improvements in agricultural productivity require a more efficient use of rural resources, especially land, labor and traction power, since these resources are the major inputs of agricultural production. Better performance of agriculture will, therefore, depend considerably on how well the constraints hindering the proper functioning of markets for these key factors of production are addressed (Omiti et. al., 2000).

Increasing population results in land scarcity and, when alternative employment opportunities outside agriculture are limited, it may eventually lead to landlessness. Under this situation, well functioning land markets may result in welfare gains by allocating the land resource to more efficient users and by permitting land consolidation to achieve economies of size. For example, Holden et al. (2001) concluded that improvement in the labor and land rental markets in the Ethiopian highlands might reduce inefficiency in the agricultural sector. Similarly, in Coastal China, improvements in land markets and associated institutions were found to be a major contributor to higher allocative efficiency (Yao, 1996).

However, for land markets to function efficiently, low transaction costs and tenure security are essential. Land tenure security is important not only for the development of efficient land markets, but also for investment in land improvement. For example, Gebremedhin and Swinton (2003) found that farmers' perceived land tenure security in Tigray, northern Ethiopia, was significantly and positively associated with long-term soil conservation investments such as stone terraces. Similarly, Feder and Onchan (1987) found in Thailand that ownership security was significant in explaining the incidence of land improvements. The findings of Pender and Kerr (1998) in India also suggest that improvements in land markets increase conservation investments on farm land.

Efficient use of the land resource also requires access to agricultural inputs such as farm labor, traction power and farm implements. At peak periods of agricultural activities, traction constraint (eg. for land preparation) or labour constraint (eg. for weeding, harvesting) may result in low land productivity. Efficient labour and traction

markets may, therefore, contribute to welfare gains by allocating these resources to their best use. However, in the absence of institutional support, markets for agricultural land, farm labor and traction are unlikely to develop and operate efficiently. The development of agricultural factor markets need broad and committed public intervention. For example, Bruce and Migot-Adholla (1994) posit that even in free market systems, other incentives in addition to security are required to encourage land sales and rental markets.

In Ethiopia, after almost two decades of socialist oriented economic policy under the military regime, the existing Ethiopian Government has been taking measures to liberalize the economy since 1991. In the agricultural sector, measures to liberalize the input and output markets and increase institutional support, such as agricultural research and extension services, have been taken. In Tigray and Amhara regions, land titling aimed at improving farmers' land tenure security has also been implemented. The titling process provides certificates of holding but does not bestow ownership since, constitutionally, land belongs to the state.

The long-term impact of the measures taken by the government to improve agricultural production will depend on their effect on the structure and stability of economic incentives available to farmers. Whether or not government policies are conducive to investment in agriculture and whether the incentive structure translates into a more sustainable use of the natural resource base are empirical questions.

This paper is intended to assess the land use and land tenure situation in the Tigray since 1991 and investigate the effect of land tenure security on land management. Descriptive and econometric analyses of data collected in 1998 from 50 *tabias*[1] (communities) and 100 villages are used. We found out that an informal land market (fixed rental and sharecropping) is emerging in Tigray, and while the quality of land is an important determinant of rental price in fixed lease, quality appears to play a limited role in determining land holder's share in share cropping. Landlessness is increasing in the region. Perceived tenure security is important for making investments in land improvements, and use of improved farming practices. However, investments in land do not appear to have a significant effect on perceived tenure security of farmers.

The paper is organized as follows. Section two presents the data and results of analysis of descriptive information. Section three deals with the empirical approach, while section four presents results of the econometric analysis. The last section presents conclusions and implications of results.

[1] *Tabia* is the lowest administrative unit in Tigray usually comprising of four to five villages.

2. DATA

The analysis in this paper is based on community level data collected from 50 *tabias* and 100 villages in the highlands of the Tigray region during 1998/99. Sample *tabias* were selected following random sampling stratified by distance to the nearest town and presence of irrigation projects. Two villages were randomly chosen from the selected *tabias*. A semi-structured questionnaire was administered to a group of representative individuals both at the *tabia* and village levels. Each group comprised of ten respondents chosen to represent different age cohorts, primary occupations, gender and villages. Information was collected on changes in agricultural and resource conditions between 1991 and 1998, and their causes and impacts.

Land use and land tenure

In Tigray, the dominant land tenure systems for rainfed cultivated and irrigated land are owner used and sharecropped, with limited use of fixed lease and borrowing. Homesteads are mostly owner used with limited use of fixed lease. However, homesteads are not sharecropped. Few *tabias* reported the existence of private pasture. Irrigated land appears to be more prevalent in more densely[2] populated areas. In 1998, 35% of *tabias* with low population density and 86% of *tabias* with high population density reported owner used irrigated lands. The results for 1991 are also similar, with 35% of *tabias* of low population density and 79% of *tabias* with high population density reporting owner used irrigated lands.

The number of landless households in Tigray is increasing. According to respondents, the average number of landless households per *Tabia* was 104 in 1991. This figure grew to 264 in 1998, an increase of 140% (Table 1). The pattern of landlessness appears to show a marked difference with population density and market access[3]. Landlessness is higher in low population density and low market access areas.

Table 1: Number of Land Less Households in *Tabia* by Population Density and Market Access

Year	Average	Population Density		Market Access	
		Low	High	Low	High
1991	104	196	64	115	63
1998	267	318	251	277	232

[2] *Tabias* were classified as high population density if they had more than 100 people per km^2.
[3] *Tabias* were classified as high market access if they are within 1 change to zero km distance from the nearest town.

Land is acquired in Tigray in several ways. These include distribution, sharecropping, fixed lease, borrowing, inheritance and "accommodation"[4]. However, there have been changes in the importance of these means of land acquisition in the region between 1991 and 1998 (Table 2). While the use of fixed lease appears to be increasing, the use of distribution, "accommodation", and inheritance are decreasing. Sharecropping arrangements also appear to be shifting towards equal share between the owner and the leaseholder. However, the use of borrowing showed no change. A household level analysis in south central Tigray showed that land transfer through leasing or sharecropping was higher in high altitude areas and with female headed households (Gebremedhin, 1998).

Table 2: Change in Methods of Land Acquisition (1991 – 1998) by Population Density and Market Access*

Means of acquisition	Average	Population Density		Market Access	
		Low	High	Low	High
Inheritance	2	1.59	2.32	2	2
Distribution	2.12	1.86	2.28	2.01	2.55
"Accommodation"	1.61	1.61	1.61	1.66	1.39
Fixed Lease	3.86	3.88	3.84	3.94	3.63
Sharecropping(1/2)	3.3	3.58	3.25	3.34	3.17
Sharecropping(1/3)	3.2	3.67	2.76	3.16	3.54
Sharecropping(1/4)	2.58	2.64	1.75	2.62	2
Borrowing	3	3	3	3	No obs

* 1 = major decrease, 2 = minor decrease, 3 = no change, 4 = minor increase, 5 = major increase

The quality of land appears to determine its rental price. In 1998, the average rental price per ha for land with fixed lease was Birr[5] 450, 550, and 845 for poor, medium and good quality land, respectively (Table 3). The rental price also appears to show marked difference with population density and market access. Rental prices tend to be higher in high population density areas. However, rental prices surprisingly seem to be higher in low market access areas.

[4] "Accommodation", locally called "Mishigishag" is an institution where a landless household is allotted land from communal land or from households who are believed to have larger land, without making a major land distribution in the community.

[5] In 1998, 7.02 Birr= 1 US $.

Table3: Average Rental Price in 1998 for Fixed Rental by Soil Quality, Population Density and Market Access (Birr/ha)

Soil Type	Average	Population Density		Market Access	
		Low	High	Low	High
Poor Soil	450	---	450	577	320
Medium Soil	550	315	709	604	452
Good Soil	845	400	972	906	746

Under share tenancy, the land holder received on average about half of the grain, and about 15% of the straw or crop residue in 1998 (Table 4). Land holders' share of grain and straw does not appear to be influenced by differences in land quality, nor by population density or market access, consistent with the standard theory about sharecropping being a balance between incentive problems in wage contracts and risk pooling advantage of sharecropping. Under share cropping arrangements, land holders contribute to labor, seed and fertilizer costs, although traction and equipment costs are entirely covered by the leaseholder. On average, land owners contributed about 10% of labor, 16% of seed and 5% of fertilizer cost in 1998 (Table 5). The proportion of labor cost covered by the land owner seems to be higher in low market access areas than in high market access areas.

Table 4: Land Holders Share under Share Tenancy by Population Density and Market Access (1998)

Out put	Soil Type	Average	Population Density		Market Access	
			Low	High	Low	High
Grain	Poor Soil	0.43	0.33	0.47	0.42	0.45
	Medium Soil	0.44	0.32	0.50	0.43	0.48
	Good Soil	0.45	0.35	0.50	0.44	0.49
Straw/Crop Residue	Poor Soil	0.14	0.09	0.13	0.12	0.18
	Medium Soil	0.13	0.11	0.14	0.11	0.19
	Good Soil	0.14	0.14	0.14	0.12	0.18

Table 5: Land Holder's Share of Cost Under Share Tenancy by Population Density and Market Access (1998)

Cost	Average	Population Density		Market Access	
		Low	High	Low	High
Labor	0.1	0.11	0.1	0.11	0.04
Seed	0.16	0.06	0.22	0.08	0.11
Fertilizer	0.05	0.09	0.03	0.06	0.03
Oxen	0	0	0	0	0
Equipment	0	0	0	0	0

The average duration of contract for both sharecropping and fixed lease arrangements appears to be two years, and seems to be independent of the type of crop planted by the leaseholder; population density and market access (Table 6). Moreover, the likelihood of renewal of lease or sharecropping contracts is not affected by the type of crop planted, or investment in soil and water conservation and tree planting (Table 7). This suggests that lease and sharecropping contracts in the region do not provide incentive to leaseholders to invest in land improvement practices.

Table 6: Average Duration (years) of Contract by Population Density and Market Access (1998)

Land Tenure	Crop Type	Average	Population Density		Market Access	
			Low	High	Low	High
Fixed Rental	Teff	1.73	1.69	1.77	1.68	1.81
	Legumes	1.69	1.62	1.77	1.68	1.70
	Other Crops	1.61	1.60	1.63	1.59	1.66
Share Tenancy	Teff	1.98	2.10	1.93	2	1.92
	Legumes	1.90	1.95	1.87	1.90	1.89
	Other Crops	1.94	2.06	1.88	1.94	1.91

Table 7: Factors Affecting Likelihood of Renewal or Extension of Land Lease or Share Cropping Arrangement by Population Density and Market Access*

	Factors	Average	Population Density		Market Access	
			Low	High	Low	High
Tenant	Plant Teff	3.06	3	3.09	3.08	3
	Plant Legumes	3.12	3	3.19	3.16	3
	Use Manure	3.14	3.1	3.16	3.16	3.05
	Invest in SWC	3.15	3.1	3.19	3.20	3
	Plant Trees	3	3	3	3	3
Owner	Invest in SWC	3	3	3	3	3
	Plant Trees	3	3	3	3	3

* 1=reduces significantly, 2= reduces slightly, 3=no effect, 4= increases slightly, 5= increases significantly

Farmers in Tigray do not perceive that their land tenure security can be enhanced by investing in the land, such as soil and water conservation practices, planting trees, clearing the land or building fences (Table 8). This perception appears to be unaffected by differences in population density or market access. However, land tenure security has a significant perceived impact on the incentive of farmers to invest in land improvements (Table 9). Land tenure security significantly affects farmers' incentives to invest in constructing soil and water conservation practices, building fences, and planting trees. Tenure security also appears to affect the likelihood of fallowing land for more than a year. The effect of tenure security on farmer incentives to invest in land improvements appears to be consistent regardless of population density or market access conditions.

Table 8: Factors Affecting Land Tenure Security by Population Density and Market Access*

Factors	Year	Average	Population Density		Market Access	
			Low	High	Low	High
Building Fences	1991	3.06	3.04	3.08	3.06	3.06
	1998	3.36	3.54	3.29	3.41	3.17
Planting Trees	1991	3.07	3.05	3.09	3.08	3.05
	1998	3.35	3.61	3.24	3.38	3.23
Cutting Trees	1991	3.10	3.25	3.04	3.11	3.06
	1998	2.95	2.73	3.05	2.93	3.06
Clearing Land	1991	3.06	3.09	3.05	3.07	3.05
	1998	3.08	3.08	3.09	3.04	3.23
Constructing or Maintaining SWC	1991	3.14	3.24	3.11	3.14	3.16
	1998	3.16	3.12	3.18	3.12	3.27
Leaving Land Fallow	1991	2.94	3	2.90	2.92	3
	1998	3.12	3	3.18	3.11	3.16
Constructing a House	1991	3.15	3.24	3.12	3.14	3.21
	1998	3.08	3.31	2.97	3.10	3

*1 = decrease substantially, 2 = decrease slightly, 3 = no effect, 4 = increase slightly, 5 increase substantially

Table9: Factors Affected by Tenure Security by Population Density and Market Access* (1998)

Factors	Average	Population Density		Market Access	
		Low	High	Low	High
Building Fence	4.96	4.9	4.98	4.96	4.94
Planting Trees	4.83	4.9	4.79	4.80	4.94
Cutting Trees	3.13	2.46	3.40	3.16	2.98
Clearing Land	4.49	4.62	4.46	4.45	4.69
Constructing or Maintaining SWC	4.70	4.70	4.7	4.64	4.94
Leaving Land Fallow	4.46	4.46	4.42	4.5	4.30
Constructing a House	3.73	3.66	3.75	3.72	3.76
Reside outside of Tabia	3.77	3.90	3.71	3.88	3.34

*1 = decrease substantially, 2 = decrease slightly, 3 = no effect, 4 = increase slightly 5 = increase substantially

3. EMPIRICAL APPROACH

Our primary focus in this paper is to determine if farmers' perceived land tenure security affects investments in land improvement and use of improved farming practices that maintain soil fertility, after controlling for other factors that could affect investment in land and improved land use. The analysis aims to test the general hypothesis that perceived tenure security will enhance investments in land and use of improved farming practices.

We used the proportion of households in *Tabia who* made private investments in stone terraces, tree planting and soil bunds between 1991 and 1998 as indicators of investment in land. We used changes in the proportion of households who used fallowing for more than a year and composting between 1991 and 1998 as indicators of improved farming practices that maintain or enhance soil fertility. Stone terraces and tree planting are long-term investments, the returns of which may take several years in the future. Hence, farmers' incentive to invest in these practices is expected to be dependent on perceived land tenure security. Soil bunds are low cost medium-term investments, but tenure security is still important for investment decisions since returns accrue in the future. Fallowing and composting are expected to improve soil fertility. However, farmers with low tenure security may not opt to fallow their land or use compost as they may not be certain of cultivating the same land during the next cropping seasons.

We used seven indicators of tenure security. These included number of land distributions in *tabia* since 1974; number of years since last land distribution in *tabia;* number of landless households in *tabia* in 1991 and change in number of landless households between 1991 and 1998; land tenure security feeling of community members in 1991, whether it was high or moderate (as opposed to highly or moderately insecure); tenure security perception of community members, whether it improved moderately between 1991 and 1998 (as opposed to no change); and tenure security perception of community members whether it improved significantly between 1991 and 1998 (as opposed to no change).

We expected that the frequency of land distributions in the community would be associated with less tenure security, and thus less investment on the land or use of improved land management practices. Number of years since last land distribution was expected to enhance tenure security and thus investment, since it is an indicator of stability of tenure in the region, after controlling for other indicators of tenure security. The number of landless households in 1991 and the change in the number of landless households were expected to be associated with less tenure security, since the higher the number of landless households, the higher would be community expectations for land redistribution to take place. The survey also solicited directly community perceptions of tenure security in 1991 and 1998. Community perceptions of tenure security in 1991 were solicited in ordinal terms (highly insecure, moderately

insecure, moderately secure, and highly secure). A dummy variable was constructed from the ordinal responses (1=highly or moderately secure, 0=highly or moderately insecure). Community perceptions of change in their tenure security in 1998 (cf. 1991) were solicited in ordinal terms (deteriorated significantly, deteriorated moderately, no change, improved moderately, and improved significantly). Since perceived tenure security either remained the same or improved in the sample communities, two dummy variables were constructed from the ordinal responses (1= improved moderately, 0=no change; and 1=improved significantly, 0=no change).

In order to isolate the effect of these tenure security variables on land investment and improved farming practices, we controlled for indicators of agricultural potential (annual precipitation and average elevation), and market access. We also controlled for changes in literacy in villages between 1991 and 1998. We included zonal dummies to control for zone specific factors that may have a bearing on land tenure, such as differences in land administration and community involvement in land related issues.

The econometric model is given by:

$$Y_{v2} - y_{v1} = a_2 - a_1 + b(x_{v2} - x_{v1}) + (c_2 - c_1)z_v + e_{v2} - e_{v1}$$

Where y_{vt} is the proportion of households in village v who invested in land or used improved farming practices in year t, x_{vt} is a vector of time varying factors affecting land investment or use of improved practices, z_v is a vector of observed fixed factors affecting land investment or use of farm practices, and e_{vt} are unobserved time varying factors. This first difference model eliminates unobservable fixed factors as a source of omitted variable bias. The observable fixed factors (z_v) will have effect only if their marginal impact has changed over time.

Perceived tenure security variables may also be endogenous to land investment, since farmers may feel that their tenure security can be influenced by their land management decisions, especially long-term investments. Analysis of descriptive information showed that farmers in the study area do not believe that their land investment decisions influence their tenure security. This result was also confirmed by an exogeneity test using Hausman's test (Hausman, 1978).

We used maximum likelihood two-limit Tobit procedure to estimate the equations for the changes in the proportion of households who invested in stone terraces, tree planting, and soil bunds, since these variables are censored from both sides. We used ordinary least squares (OLS) to estimate the equations for the changes in proportion of households using fallowing and composting since theses variables were continuous.

5. RESULTS

Results of the determinants of land investments are given in Table 10. Three of the seven tenure security variables in the case of investment in stone terraces, and two of them in the case of tree planting are significant with the expected signs, supporting the general hypotheses that tenure security is important for investment in land. In the case of investment in soil bunds, two of the tenure security variables are significant with one having the expected sign.

Table 10: Determinants of land investments in the highlands of Tigray[1]

Variable	Stone Terrace (Tobit[2])	Tree Planting (Tobit[2])	Soil Bund (Tobit[2])
Number of land distribution since 1974	0.01540	0.04374	-0.03698
Number of years since last land distribution in *Tabia*	0.02663**	0.01294	-0.02486
Number of landless households in *Tabia* in 1991	-0.00053**	0.00048	0.00211***
Change in number of landless households (1991 – 1998)	-0.00073***	0.00004	-0.00081
If community felt very or moderately secure in 1991	0.15732	0.68895**	0.14717
If land tenure security improved significantly (1998 – 1991)	-0.06490	0.74333***	0.081103
If land tenure security improved moderately (1998 – 1991)	-0.06330	-0.24963	0.35504**
Average elevation (meters)	0.00042*	-0.00169	0.00003
Average annual precipitation (mm)	0.00062	0.00169	-0.00275**
Change in proportion of households who are literate (1998 – 1991)	0.47635**	-0.76777	0.27268
Distance to market (walking minutes)	0.00018	0.00047	-0.00057
Central Zone *(cf. South Zone)*	0.18188	0.31770	0.19013
East Zone *(cf. South Zone)*	0.05512	0.41756	0.05169
West Zone *(cf. South Zone)*	0.21141	0.32152	0.27355
Area of *Tabia*	0.00164	0.00197	-0.00454**
Constant	-1.3333	-2.5143	1.79430
Number of observations	91	88	91
F	3.55	2.25	3.38
Prob > F	0.0001	0.0008	0.0002

*** Significant at 1%, ** significant at 5%, * significant at 10%.

[1] All regression results are corrected for sampling stratification and weights, and standard errors are robust to hetroskedasticity and non-independence within the primary sampling units.
[2] Survey Interval Regression was used to estimate the two-limit maximum likelihood Tobit models.

The duration since last land distribution in *tabia* is associated with higher investments in stone terraces, as expected, but failed to influence investments in tree planting or soil bunds. Number of landless households in 1991 and change (increase) in number of landless households between 1998 and 1991 are associated with less investment in stone terraces. When the number of landless households increases, the expectation of communities for a redistribution of land to occur increases thus reducing the tenure security perception of land owning households. However, the number of landless households in 1991 is associated with investment in soil bunds. It could be that farmers with less tenure security resort more to investing in soil bunds, practices that are low cost and medium-term soil and water conservation investments. Gebremedhin and Swinton (2003) found that tenure security is more important for investment in durable long-term investments such as stone terraces, than for short-term low cost investments such as soil bunds.

Communities which felt secure about their land tenure in 1991 and communities whose tenure security perception improved significantly between 1991 and 1998 invested more in tree planting than those who felt insecure in 1991 and those whose tenure security perception remained the same between 1991 and 1998. Moreover, moderate improvement in tenure security is also associated with increased investment in soil bunds.

We also found out that investment in stone terraces is higher in higher altitude areas, and in areas where literacy is higher. Literacy, as a means of access to written information, may raise the awareness of households regarding the availability and importance of land investments, and improved efficiency of farm operations. Investment in soil bunds is less in areas of higher rainfall, perhaps because of water logging problems, but higher in higher elevation. Area of *tabia* decreased investment in soil bunds.

The results of the regression estimates for fallowing and composting also support the general hypotheses that tenure security is important for improved farming practices that would have a carry-over effect in soil fertility (Table 11). Secure land tenure perception of communities in 1991 is associated with higher fallowing, as expected. Increases in number of landless households in *tabia* is also associated with reduced fallowing. Moderate or significant improvements in perceived tenure security is associated with higher use of composting. However, contrary to expectations, we found out that moderate improvement in land tenure security is associated with reduced fallowing. Fallowing is higher in higher altitude areas, and in areas closer to market places. There is more use of fallowing in the eastern zone compared to the southern zone, and more use of composting in the central zone compared to the southern zone.

Table 11: Determinants of use of improved farming practices in the highlands of Tigray[1]

Variable	Fallowing (OLS)	Composting (OLS)
Number of land distribution since 1974	-0.00201	0.03516
Number of years since last land distribution in Tabia	0.00766	0.00315
Number of landless households in Tabia in 1991	0.00001	0.00012
Change in number of landless households 1991 - 1998	-0.00025**	-0.00002
If community felt very or moderately secure in 1991	0.11073*	0.08529
If land tenure security improved significantly (1998 – 1991)	0.00382	0.21856*
If land tenure security improved moderately (1998 – 1991)	-0.09674**	0.20113***
Average elevation	0.00017***	0.00008
Average annual precipitation	0.00022	-0.00004
Change in proportion of households literate (1998 – 1991)	0.00023	0.05844
Distance to market	-0.00023**	-0.00016
Central Zone *(cf. South Zone)*	0.01583	0.13834**
East Zone *(cf. South Zone)*	0.08742*	0.08030
West Zone *(cf. South Zone)*	0.00189	0.07078
Tabia area *(cf. South Zone)*	.00199***	-0.00145
Constant	-0.74437	-0.19051
Number of observations	91	91
R-squared	0.28	0.32

*** Significant at 1%, ** significant at 5%, * significant at 10%.

[1] All regression results are corrected for sampling stratification and weights, and standard errors are robust to hetroskedasticity and non-independence within the primary sampling units.

One of the reasons that the explanatory variables may be insignificant is if there is a high colinearity among the variables. We tested for multicollinearity and found that it is not a problem in the data set. The maximum variance inflation factor we found is 8, and most variables have variance inflation factors of less than 5.

6. CONCLUSIONS AND IMPLICATIONS

According to survey respondents, landlessness is increasing in the Tigray region. Between 1991 and 1998, the number of landless households per *tabia* grew by more than 140%. Informal land transactions are practised in the region, including sharecropping, fixed lease paid in cash or in kind, and borrowing. The use of fixed lease as a means of land acquisition, although very low, appears to be increasing, and sharecropping arrangements seem to be shifting towards equal share between the landholder and the leaseholder. While the rental price of land seems to depend on the quality of land, sharecropping ratios appear to be independent of the quality of land.

While land owners cover part of labour, seed and fertilizer costs in sharecropping arrangements, traction and equipment costs are entirely covered by the shareholders. The average term for sharecropping and fixed lease is about two years, and is not influenced by the type of crop planted. Likelihood of renewal of sharecropping or lease contracts is not affected by the type of crop planted or land investment by the tenant. Farmers reported that while tenure security is highly likely to affect farmer incentives to invest in land, farmers' investment in own land is unlikely to affect tenure security. Irrigated land appears to be concentrated in high population density areas.

Econometric analysis of the effect of tenure security in land investments and use of improved farming practices show that tenure security is an important determinant of farmers' incentives to invest in land and use improved farming practices. Stability of tenure encourages investment in stone terraces, while tenure insecurity due to a higher number of landless households has the opposite effect. Moderate improvements in perceived tenure security results in higher investment in soil bunds. Significant improvements in tenure security is important for investment in tree planting.

Our results imply that improving tenure security is important for improved land management in the region. The land titling that took place in Tigray, coupled with the regional legislation that prohibits further land redistribution, is an important step in this direction. However, legal guarantee for farmers' use rights in perpetuity, their right for compensation for investments made in land in case of special-circumstances of land redistributions, and the right to bequeath land to children could strengthen tenure security.

The results also imply the need to explore the potential role that public policy plays to facilitate the development of the fledgling land market. Moreover, restrictions on land exchange, such as those which limit land transactions to two years, may need to be revisited. The wishes and preferences of farmers regarding land tenure arrangements and land administration should be considered as crucial inputs to future tenure arrangements in the region.

An open, concerted and inclusive debate on the relevance and feasibility of alternative land tenure systems for the country or different parts of the country needs to be encouraged. The debate on land tenure should broader than being fixated on the state/public versus private ownership dichotomy, since these are only two polar end points of a continuum of several possible tenure arrangements. Each potential land tenure system needs to be evaluated in terms of its effect on the tenure security it provides to farmers, since security is more important than the mode of ownership.

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Annex: Summary statistics of variables used in regression

Variable	No of observations	Mean	Std. Dev.	Min	Max
Proportion of households who invested in soil bunds (1991-1998)	100	0.23	0.30	0	1
Proportion of households who privately invested in SWC (1991-1998)	100	0.52	0.30	0	1
Proportion of households investing in tree plantation (1991-1998)	100	0.58	0.36	0	1
Change in proportion of households using compost between 1998 and 1991	100	0.17	0.25	-0.80	0.90
Change in proportion of households fallowing between 1991 and 1998	100	-0.07	0.13	-0.50	0.10
Number of land distribution in *Tabia* since 1974	100	3.58	1.12	1	6
No of years since last land distribution in *Tabia*	100	8.84	2.53	1	19
Number of landless households in *Tabia* in 1991	100	89.26	157.65	0	750
Change in number of landless households (1991-1998)	100	160.60	168.65	-210	800
If community felt very or moderately secure in 1991	100	0.80	0.40	0	1
If land tenure security improved significantly (1998-1991)	100	0.16	0.37	0	1
If land tenure security improved moderately (1998-1991)	100	0.66	0.48	0	1
Average elevation (meters)	92	2003.04	297.21	1278.73	2725.14
Average annual precipitation (mm)	92	641.10	85.57	501.37	870.5
Change in proportion in households who are literate (1988-1991)	88	0.34	0.12	-0.19	0.62
Distance in market (walking minutes)	100	167.20	124.76	10	720
Central Zone	100	0.34	0.47	0	1
East Zone	100	0.24	0.43	0	1
West Zone	100	0.14	0.35	0	1
Area of *Tabia*	98	57.24	35.24	12.30	179

TRADE LIBERALIZATION AND THE COFFEE SUB-SECTOR: SOME IMPLICATION FOR THE FOOD SUB-SECTOR*

Alemayehu Geda[1]

Abstract

In this study an attempt is made to examine trade liberalization and its implications for the coffee sub-sector. Pre and post- reform data are analysed on the basis of 'the before after approach'. The study shows that the liberalization carried out is strongly associated with an increase in the level of export. This result is chiefly attributed to the exchange rate policy pursued. The micro evidences examined show that the supply price elasticity for coffee is either small or statistically insignificant. This implies that price liberalization by itself may not bring a major change in the coffee sub-sector. The study also underscores the problem of ensuring food security by relying on unreliable world primary commodity markets.

1. INTRODUCTION

Coffee is the major export commodity of Ethiopia, contributing an average of 65% to total export earning (foreign exchange) and providing a source of livelihood for a large number of farmers. The volume of coffee export, prices and farm income are dependent largely on both national and international markets as well as trade policies. It is therefore important to assess the impact of domestic and international agricultural trade policies on coffee exports in Ethiopia and how this affects national and household food security.

There are a number of policy measures, both national and international, that have an impact on the export sector and food security in Ethiopia. One of the most relevant of these measures that needs to be considered in the context of this study is the Structural Adjustment Program (SAP), prescribed by the IMF and the World Bank and under implementation in Ethiopia since 1992. This policy package, which includes

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* The final version of this article was submitted in June 2003.

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An enlarged version of this paper can be obtained form Action Aid Ethiopia. I would like to thank Action Aid Ethiopia for offering me the opportunity to work on this topic, which is part of Action Aid's research program in a number of African countries. Thanks are also due to Elias Kedir for his assistance and two anonymous referees and the language editor of the journal for their invaluable comments. The usual disclaimer applies.

trade liberalization as one of its components, has the same effect as the implementation of the Agreement on Agriculture (AoA). In this agreement Ethiopia had already committed itself to lifting most agricultural subsidies and reduced tariffs substantially although it is not a member of the World Trade Organization (WTO).

This study is concerned with the evaluation of the components of SAPs that are relevant to the coffee sub-sector and their implications for food security. The paper is organized as follows: Section two will outline the methodologies employed in evaluating liberalization schemes such as SAPs and justify the approach adopted in this study. In section three Ethiopia's external trade policy is examined in order to give a background for the analyses in sections four and five. Section four deals with the evaluation of liberalization and its impact on the coffee sub-sector. Section five is devoted to draw implications for food security by examining the existing micro-based studies. Section six provides the conclusions of the paper.

2. THEORETICAL ISSUES IN EVALUATING LIBERALIZATION PROGRAMS

Since the 1980s, the World Bank and IMF, and increasingly WTO- inspired programs of liberalization have been carried out in almost all African countries. There is a serious disagreement about the effect of these programs in the literature (see Alemayehu 2002). One major problem in understanding the effect of these programs is lack of agreement on the methodology appropriate to evaluate such liberalization schemes. There are at least five approaches employed in the evaluation of the impact of Bank/Fund supported programs in general and trade liberalization in particular: (1) the *before-after* approach; (2) the *with-without* approach; (3) the *actual-versus-target* approach; (4) the *modeling/simulation* approach, and (5) the *econometric* approach (See Khan 1990; Pio 1994)

The literature on evaluation of structural adjustment programs and the attendant liberalization is dominated by the *before-after* approach. Other works cited include, *inter alia*, Killick (1984), Zulu and Nsouli (1985), Poster (1987) (see Goldestin and Montiel, 1986; Khan 1990). This approach basically compares performance of the economy (or major macro variables) before and after liberalization or before and after the implementation of SAPs. Although it is to apply, the approach is fundamentally based on the *cetirus paribus* (other things being equal) assumption which makes it difficult for it to capture the independent effect of the reform (Khan, 1990: 2001). In other words, it has no mechanism to filter out the effect of other factors other than the reform, which could have a bearing on the outcome.

The *with-without* approach is designed to overcome the weakness of the *before-after* approach and hence serves as a supplement to it (Goldestin and Montiel, 1986:305; Khan, 1990:201). The approach attempts to distinguish between the program and

non-program countries and compares the outcomes. It assumes that countries with and without a (liberalization) program face an identical environment and, hence, any difference observed in the program countries is attributed to the effect of the program. The *with-without* approach was first used by Donovan (1981, 1982). Later works using this approach include Loxley (1984), Gylfason (1987) and Pastor (1987) (all cited in Khan 1990). The major weakness of this approach is that countries with and without the program, however accurately they are selected, could not be identical. Moreover, as noted by Khan (1990), program countries are not randomly selected. Instead, they are selected for having relatively poor economic performance prior to the program period. Goldestin and Montiel (1986), however, suggest that identifying and controlling the specific differences in the initial position of the program and non-program countries can overcome this limitation. With this modification they came up with *Modified Control Group* approach.

The other methodology in the literature is the *actual-versus-target* approach. This approach compares the actual outcome of major macro variables with the targets set for such variables (see Pio 1994; Khan 1990). Although it is not frequently used, one of the major weaknesses of this approach is the bias that could arise during evaluation as a result of targets that might have been set either below or above what could realistically be attained.

The *Modeling/Simulation* approach compares the outcome of different policies, such as liberalization, using an economy-wide (usually macro) model. It is basically a counterfactual analysis. Comparatively speaking this approach is theoretically neat. According to Khan (1990), it has three advantages. First, one can draw on a wider body of adjustment/liberalization experiences. Second, since the policy simulations can be specific, one does not have to worry that incomplete implementation of the policies will blur the result. Finally, the approach by its very nature focuses on the relationship between policy instruments and policy targets (Khan, 1990: 207). This approach is, however, extremely demanding in terms of having an empirical model and is vulnerable to what is called the 'Luca's Critique'[2] (Khan, 1990).

The final approach cited in the literature is the *econometric approach*. This approach makes use of regression analysis to evaluate policy performance, after making correction for socio-economic and external variables (Pio, 1994:299). This approach is basically similar to that of *Modeling/Simulation*. The difference between the two approaches is that the econometric method is a partial equilibrium based analysis while the modeling approach is closer to a general equilibrium analysis.

All these approaches have strengths and limitations of their own. This is partly the reason for obtaining a wide range of results, which more often are conflicting. Ideally it would have been enlightening to employ all the methods. But, neither data nor availability of models allows us to do that in this paper. Thus, the paper basically

[2] Parameters of the predicting model could change along policy change/simulation.

employs the *before-after* approach. At times it resorts to the *econometric* approach based on research undertaken by the Department of Economics of Addis Ababa University.

3. ETHIOPIA'S EXTERNAL TRADE POLICY

3.1 The Pre-1991/92 (Pre-Reform) Period

Before 1974, the foreign trade policy of the country was largely influenced by 'the free trade' doctrine. Measures such as the establishment of the Chamber of Commerce, the establishment of boards (Coffee Board, Grain Marketing Board and Office of National Standards) were taken to facilitate trade. These measures were aimed at controlling the quality of imports and exports and facilitating trade. With regard to imports, capital goods and raw materials were imported duty-free while others were taxed (Ministry of Trade, 1987).

The period 1974 -1991 was on the other hand, characterized by a centralized economic system where the state was given a significant role in all spheres of economic activity, including external trade. This period was characterized by attempts: (a) to control the participation of private capital in trade and strengthen the role of the state both in export and import trade; (b) to closely monitor the price, quantity and distribution of goods; (c) to focus on the external trade sectors deemed essential for economic growth and to engage in the trading of medical equipment and goods that ensure the health and security of the population and (d) to diversify the type and destination of goods (especially those from developed capitalist countries to socialist countries) externally traded.

3.2 The Post-1991/92 (Post-Reform) Period

The post-1991 foreign trade policy of the government has the following objectives: (a) ensure private sector participation; (b) mange the sector by issuing foreign exchange and import-export regulation; (c) provide adequate incentives to the export sector; (d) replace quantitative restrictions with tariffs; (e) encourage diversification of exports and minimize illicit trade; and (f) carry out restructuring of the state-owned trading enterprises (MTI, 1997).

To realize these objectives, the government has implemented policies the most prominent of which are: (a) liberalization of the exchange rate market using the auction system that provides foreign exchange both to the private and the public sectors; (b) simplification of the licensing procedure; (c) provision of supportive services to private exporters in the area of transport, package training, overseas market research, etc; (d) a simplification of tariff structure and introduction of foreign exchange retention scheme (MTI, 1997).

In relation to point (d) above, most goods which used to be imported duty free and those with specific duty rates are replaced by *advalorem* rates. Goods subject to duty or not are given a tariff code and classified on the basis of their type and characteristics into 21 sections and 99 chapters. These chapters contain 5291 goods classification of which 169 are duty free, 5119 with *advalorem* rates from 5-50 percent and 3 with specific rates (used clothing, and other textile produces and rags). Currently the weighted-average tariff rate is 24.6 percent, the minimum and maximum tariff rates being 5 and 50 percent, respectively. These rates were used to be as high as 230 percent during the previous regime (MTI, 1996: 17; MTI, 1997: 3).

Apart from customs duty, sales and excise taxes are also paid on imported goods, the sales tax being 15 percent of the value of goods. Similarly excise tax varies from item to item, the highest being 200 percent and the lowest 10 percent of the value of goods taxed (MTI, 1996: 19)[3]

With regard to imports, an attempt is made to facilitate import-licensing procedures. Currently there is no export duty except on coffee. The amount of customs duty on coffee is Birr 15 per 100 kg. There is also a transaction tax of 2 percent of sales and Cess tax of Birr 5 per 100 kg. In addition, surtax is collected on coffee based on the daily surtax rate of the international coffee market prices (MTI, 1996: 25; See also Taye 1997).

The EPRDF government has also established two types of duty incentive schemes: 'Duty Drawback Schemes' to those who are wholly or partially engaged in exporting and 'Duty-free Importation Scheme' to those who are wholly engaged in the business (MTI, 1996: 25). Moreover, exporters can retain 50 percent of their export earnings and remittance in foreign currency in retention accounts. From the 50 percent the account holder should offer 40 percent for sale no later than 21 days (currently extended to four weeks) from the date of receipt of the foreign exchange to commercial banks at negotiated rates, or to the auction market through his/her banks. The remaining 10 percent should be used by the account holder for the purpose of importing goods and services, export promotion and any other payment specifically approved by the National Bank (MTI, 1996).

In general, compared to the pre-1991 period a major policy shift is observed in the post-1991 period. Essentially the policy regime has shifted from a 'controlled regime' toward a 'more liberalized' one. This change is chiefly related to the Structural Adjustment Program the country has been implementing since 1992. The next section will explore the impact of this liberalization scheme in the coffee sub-sector.

[3] These taxes are now (by 2003) replaced by a new 'value-added' tax of 15 percent.

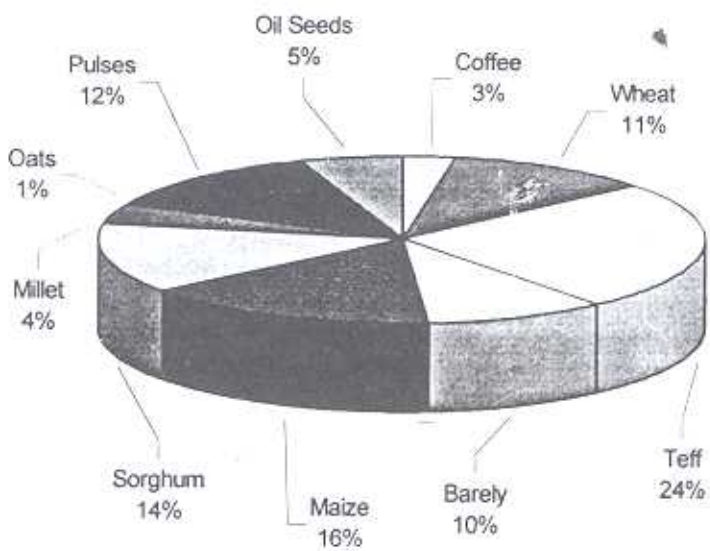
4 THE ROLE OF COFFEE IN THE ETHIOPIAN ECONOMY AND THE IMPACT OF LIBERALIZATION

As noted above coffee is the most important export crop of Ethiopia. Accordingly, its contribution towards the growth of a dynamic economy by allowing the importation of developmental goods and the creating of employment is enormous. This section will briefly examine the pattern of production in the sub-sector, the place of coffee in the total exports of Ethiopia and the contribution of coffee to the government's revenue.

4.1 Pattern of Production in the Coffee Sub-Sector

Figure 1 shows total area of the country under cultivation in 1997/98. It is based on the agricultural sample survey conducted by the Central Statistical Authority. As can be seen from the Figure coffee occupies only 3 percent of the total area under cultivation (195,700 hectares). The combined share of coffee, pulses and oil seeds is about 20 percent, leaving the bulk of the area under cultivation for food crops.

Figure 1: Area Under Cultivation (for the year 1997/98)



Source: Central Statistical Abstract (CSA): Agricultural Sample Survey 1990EC (1997/98)

As can be seen from Table 1, the area under coffee cultivation has been increasing since 1991/92The increase lasted from 1991/92 until 1995/96 and declined a little thereafter. Notwithstanding this decline, area under cultivation in 1997/98 was much higher than the 1991/92 levels.

In general, it may be concluded that area under coffee cultivation has increased since the onset of the liberalization program in Ethiopia. Between 1992 and 2002, the Birr (the local currency) depreciated from Birr 5 per USD in 1992 to Birr 8.59 per USD (in 2002). This implies that the return from coffee in terms of local currency has increased and this could be considered as one of the reasons for the increase in area under coffee cultivation. If a fixed supply of factors of production (in particular labour and land) and full employment of these resources is assumed, and no fundamental change in productivity exists, it is reasonable to predict that area under food production has declined[4]. This could be against the notion of 'food sovereignty' – a concept advocated by critics of trade-based food security (see below).

Table 1: Area Under Coffee Cultivation: (000 hectares)

Year		
Ethiopian Calendar	European Calendar	Area
1986	1993/1994	130.84
1987	1994/1995	183.56
1988	1995/1996	202.13
1989	1996/1997	191.63
1990	1997/1998	195.70

Source: Central Statistical Authority, Agricultural Sample Survey, Various Issues

Table 2 shows the productivity and production of major coffee producing regions in Ethiopia. The peasant sector (smallholder producers) is the dominant feature of Ethiopia's coffee production. This sector accounts for more than 95 percent of the coffee produced in the country, leaving less than 5 percent to the modern (commercial farm and state) sector. As can be seen from Table 2 the modified forest coffee (normally grown in a single stand with very little activity such as slashing once a year to facilitate picking) and garden coffee (coffee grown around home, intercrossed with food crops) constitute more than 90 percent of the total coffee production (see also Taye 1997, Itana 1999). Table 2 also shows that the bulk of

[4] The fixed factors of production (both land and labour) assumption can be contestable. This is in particular true because the available arable land which is uncultivated is large. The micro level evidence cited below, however, seems to suggest a possibility of substitution of cash crop production for food crops (I thank one of the referees of the journal for pointing out this point).

coffee in the country is produced in five regions: Keffa, Illubabor, Wellega, Sidamo and Hararghe.

Taye (1997), based on the 1984 'National Coffee Survey', notes that 85.3 percent of the coffee in the five major regions is grown by small holders, 88 percent of the land under coffee is also found in these regions and this accounts for more than 90 percent of natural (wild) coffee output. Another interesting aspect of coffee production in Ethiopia is that a significant amount of total output is lost due to Coffee Bury Disease (CBD).

Table 2: Production pattern: The Peasant Sector

Type	Productivity, Yield/ha	Share of Total	Region
Modified Forest*	350kgs/ha	55%	Keffa, Illubabor, Wellega
Garden Coffee**	450kgs/ha	35%	Sidamo, Shoa and South and North Omo
Hararghe Coffee***	400kgs/ha	5-10%	Harraghe

* Grows under shades at densities around 4000 trees per hectare
** Planted at low density (100-1800 trees/ha and sometimes inter-cropped with food crops)
*** Grows in marginal climate at 900-1200 trees/ha, sometimes inter-cropped with food crops/*Chat*
Source: ULG consults Limited (1987) (Itana, 1999, Page 75)

4.2. Liberalization Scheme Relevant for the Coffee Sub-Sector and Its Impact

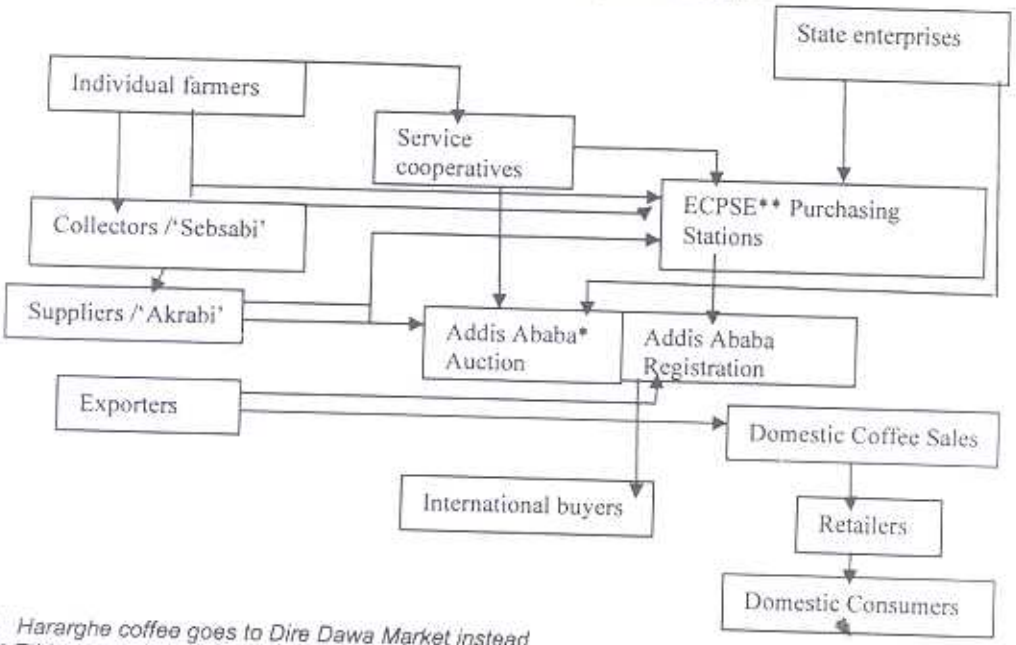
4.2.1 Domestic Trade Liberalization

Domestic trade liberalization is one of the components of the liberalization scheme relevant to the coffee sub-sector. This can be seen from two important angles: measures taken in marketing and pricing. These two issues are briefly discussed in this sub-section.

The liberalization scheme adopted in Ethiopia has a significant impact on coffee marketing. Before the 1992 reform, the Ethiopian Coffee Marketing Corporation (ECMC) had the monopoly of purchasing and exporting coffee. It controlled more than 80 percent of the total supply to the official market. While the ECMC was engaged in the purchasing and sale of coffee both to the domestic and export markets production was managed by two public institutions, the Coffee Plantation Development Corporation (CPDC) and the Coffee Development and Project Implementation Department (CDPI). CPDC was responsible for running nationalized commercial farms; CDPI for managing the small peasant sector. This centralized controlling of the marketing activity came to and end after the 1992 reform. The Ministry of Coffee and Tea Development was reduced to an "authority" and was

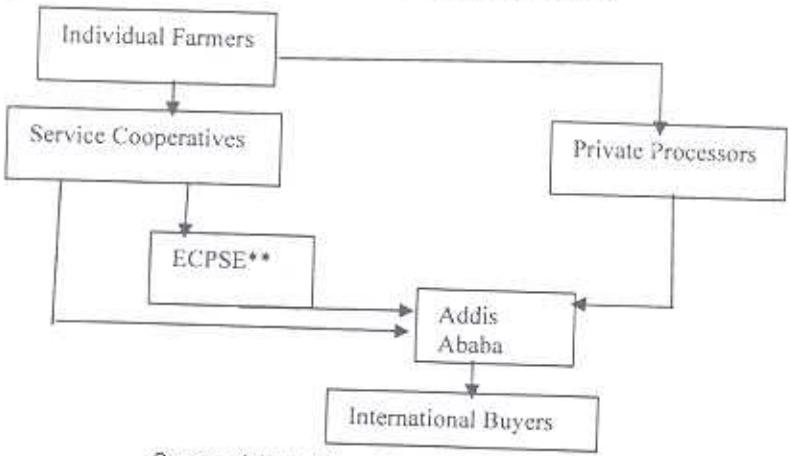
mandated to promote the growth of coffee and tea production, trade and processing. Coffee development activities are largely left for regional bureaux. Moreover, two institutions, the Ethiopian Coffee Purchase and Sale Enterprise (ECPS) – limited to domestic operation – and the Ethiopian Coffee Export Enterprise (ECEE) – which operates competitively with the private sector- were established (See Taye 1997: 36-39). Figures 2a and 2b below depict the new marketing structure. The two Figures show agents of the marketing network . The collectors and suppliers are the intermediaries that supply to the central market, since the individual farmers do not have direct access to the central market. Agents having export licenses sell, primarily through the central market (Addis Ababa registration). They can also sell directly to the domestic market if they wish, or if they do not find international markets. The figures also show that the role of these agents is reduced due to the fact that cooperatives and state enterprises are given less importance in the post-Derg regime.

Figure 2a: Market Structure for Sun-dried Coffee



* *Hararghe coffee goes to Dire Dawa Market instead*
** *Ethiopian Coffee Purchase and Sell Enterprise*

Figure 2b: Market Structure for Washed Coffee



Source: Adopted from Taye (1997)

The pre-reform period was also characterized by price control. The government determined the price after setting the level of taxes and marketing margins. The basis for computing the local price (which includes taxes surtax) had initially been the price for the Brazilian Santos 4, then the 'composite price of ICO' was adopted. Both of them depart from the world price for coffee. Since 1990 the base for the calculation of coffee surtax and the auction price has been the fob daily price of Jimma 5. To arrive at the auction price deduction for clearing costs, transport, bank and insurance charges, taxes and exporters' margin are made out of the fob price.

Since 1992 a floor farm-gate (producer's) price has also been introduced. The price varies across regions as shown below and participants in this market may compete above this price level. Since actual farm-gate prices were not available the analysis below is based on the official farm-gate prices.

Table 3: Farm-gate Price

Regions	Producer's Price (Birr/Kg)
Jimma	4.20
Illubabor	4.20
Wallaga	7.00
Sidamo	6.50
Hrarghe	9.10

Source: Coffee and Tea and Development Activity (cited in Abdurahman 1995, Taye 1997)

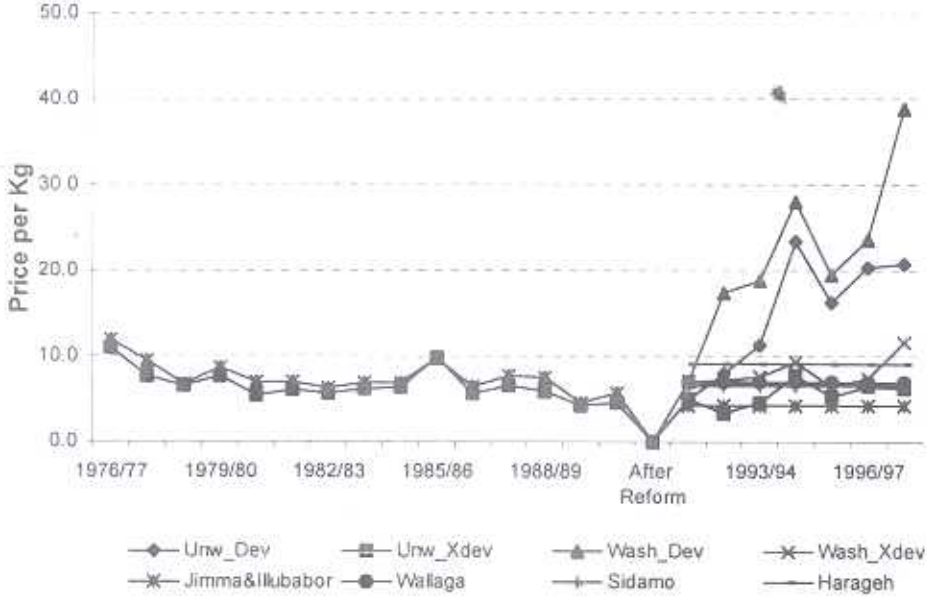
Figure 3 shows the farm-gate and fob prices for unwashed and washed coffee. The data for each type of coffee (washed and unwashed) is computed both using actual price in Birr (which includes the effect of exchange rate liberalization) – denoted Wash_Dev and Unw_Dev, respectively, and a hypothetical price where the exchange rate is assumed to remain as it was before devaluation (Birr 2.07 per USD)- Wash_Xdev and Unw_Xdev.

The Figure shows that the farm-gate prices of both washed and unwashed coffee are above the floor set for farm-gate prices of only Jimma and Illubabor. If the effect of the devaluation is not taken into account, the fob prices would have been below the floor farm-gate price set for Hararghe. From this analysis it can readily be inferred that other liberalization schemes (except devaluation) had no significant effect on the unit fob (in Birr) value of both washed and unwashed coffee.

However, when the effect of the devaluation is taken into account the fob price (in local currency) increased dramatically. This upward trend has a similar pattern both for unwashed and washed coffee, the highest being for the latter, which might be related to the relatively high quality nature of the washed coffee. The highest floor

price (the Hrarghe farm-gate price[5]) constituted 25 and 50 percent of washed and unwashed coffee fob prices, respectively, in 1997/98. It is worth presenting this analysis in the context of early farm-gate price studies. The earliest study undertaken by Teshome (1979) puts the producers' share of FOB price between 61 and 69 percent in mid 1960s to 1970s The next study, which attempted to examine the effect of liberalization on the share of coffee producers' price, by Hamza and Azanaw (1995) noted that the average share increased from 42 percent the Derg period (1974-1991) to 75 percent by 1992-94. Recently, Love (2000) examined carefully various studies, and estimated the share of coffer producers to be in the range of 61-64 percent of the national auction prices and between 50-56 percent of the FOB prices. Given these findings, it is reasonable to assume that a good percentage of the effect of devaluation (or at least the *change* in price, *cetrus paribus,)* passes to the producers.

Figure 3: Farmgate and Fob Price (based on Table 10)



[5] There is no time series data on farm-gate price. Abdurahman's (1994) study for Hararghe shows that the actual farm-gate price ranges form Birr 11 to 20 per kg in 1994.

4.2.2 Foreign Trade Liberalization

The liberalization of foreign trade in coffee is part of the general liberalization program commenced in 1992. Two important issues can be singled out in this connection. The first relates to an enormous simplification of entry into the coffee exporting business. This is contained in Proclamation No 70/1993 that amended the Coffee Trade Proclamation No. 263/1984. This amendment gave both the licensing and license renewal fees for engaging in the coffee exporting business sector. A second and related reform measure is the simplification of coffee export taxes. The post-reform period witnessed an enormous reduction and simplification of taxes levied on coffee exports (the details are given in section 4.2.4).

The overall effect of this liberalization program in the foreign trade sector is to raise the participation of private economic agents in exporting coffee. For instance, the share of private coffee suppliers increased from 20 percent in 1989/90 to 82 percent in 1992/93 while the share of private exporters increased from 37 percent in 1989/90 to 85 percent in 1992 (Abdurahman 1995). In 1997, 62 private exporters were engaged in the coffee exporting trade. This figure was merely 13 in 1991. According to Taye's figure, obtained from Coffee and Tea Authority, the share of private exporter in the total exports jumped form 13.52 percent in 1989/90 to 52.51 percent in 1995/96 (Taye, 1997: 44). Currently it is estimated that the share of private exporters is in the vicinity of 70 percent. Similarly, the number of coffee processing stations has increased following trade liberalization. According to the figures of the Coffee and Tea Authority, by August 1998 there were a total of 388 wet coffee processing stations (164 owned by cooperatives, 195 by private and 29 by public). On the other hand the number of 'dry coffee processing' stations were 206 (of which 135 are owned by the private operators).

4.2.3 Exchange Rate Liberalization: Devaluation

One component of the liberalization program that has a direct bearing on the coffee sub-sector is the exchange rate policy pursed after 1992. The exchange rate reform commenced by devaluing the currency that was fixed at Birr 2.07 per 1 USD for nearly two decades. This reform, made in October 1992, devalued the Birr by 140 percent, making one USD exchangeable for 5 Birr. Such massive devaluation was partly justified by the premium on the parallel market that was close to 238 percent.

In 1993, the National Bank of Ethiopia (NBE) introduced the auction-based exchange rate system, which used to be conducted on fortnightly basis and took the form of the 'Dutch Auction' system (discriminatory price), where the marginal rate, which cleared the market, was taken as the ruling rate for the following two weeks. The supply of funds for this market came from export earnings and loans & grants. The auction-based exchange rate system was initially working side by side with the official exchange rate. This system was overseen by a committee composed of the

representatives of the NBE, Ministry of Finance, Ministry of Economic Development and Cooperation (MEDaC) and two members of the private sector.

In the course of the implementation of the system more liberalization efforts (such as reducing the bid cover requirement, abolishing of negative import list as well as the ceiling on demand for foreign exchange etc) were made. After the 86th auction (in July 1996), the NBE introduced a weekly auction replacing the previous one that used to be held on fortnightly basis. By August 1995, the official or fixed exchange rate (that had been used for importation of fertilizer, petroleum and pharmaceutical products as well as paying Ethiopia's contribution to international organizations and external debt-servicing) became unified with the auction rate (Table 4 shows the evolution of the official, the parallel and the auction rates). Moreover, the NBE replaced the retail auction system by a wholesale auction system where banks are taken as wholesale bidders.

Table 4: Exchange Rates in the Post-Reform Period (Birr per US$)

Annual Average, Birr/US$b	1993/94	1994/95	1995/96	1996/97	1997/98 (Qrt I)	2002/03
1. Official Rate	5.09	5.86	6.32	6.47	6.80	~8.59
2. Marginal Rate	5.77	6.25	6.32	6.47	6.80 (Sept.)	~8.59
3. Divergence = [1-2]	Birr 0.68	Birr. 0.39	unified			
4. Parallel Market	7.05	7.30	7.64	7.16	7.23	~ 8.70

Source: NBE, Quarterly Bulletin, 1997/98. ~ Recent daily rate (approximate value)

The immediate implication of the devaluation and the subsequent auction-based exchange rate determination is raising the value of coffee export earnings in terms of domestic currency. This, it is presumed also raises the farm-gate prices of coffee. The latter may in turn encourage resources (such as land and labour) shift towards the coffee sector. This shift could well be at the expense of other sectors – most importantly the food sector. The existing evidence on this issue is discussed in section five.

The export earnings from coffee, subject to the National Bank's interventions, have also a direct bearing on the determination of the auction-based exchange rate. This is because coffee export earnings form part of the supply of foreign exchange in the auction market. Thus, not only the auction-based exchange rate affects the supply of exports but it is also affected by the export earnings. This in turn implies that an increase in supply of coffee might have a dynamic detrimental effect (through lower auction-based exchange rate) on the income of coffee suppliers.

4.2.4. Tax Reforms and Coffee's Contribution to Government Revenue

The tax reform provisions on coffee are provided in proclamation No 70/1993 - 'A Proclamation to Amend the Coffee Trade Proclamation No. 263/1984' and

Proclamation No 99/1998 which is a 'Proclamation to Provide the Payment of Tax on Coffee Exported from Ethiopia'. The former basically provides for the coffee trade and license issuance and renewal fees as shown below.

Table 5. Fees for Issuance and Renewal of License

No.	Description of License	Fees for Issuance and Renewal (Birr)
1	Coffee Export License	200
2	Coffee Supply License	150
3	Coffee Clearing License	150
4	Coffee collecting License	150
5	Coffee Trade Auxiliary License	150
6	Coffee Washing License	150

Source: Proclamation No 70/1993 in Negarit Gazeta, 4th Year No. 18, 1998.

Proclamation No. 99/1998 has the objective of: (a) consolidating the taxes and duties. levied by different Proclamations and Regulations into a single tax facility, (b) converting specific rates into *advalorem* rates so as to ensure equitability of tax and (c) to lay down procedures to protect revenue against fluctuations due to changes in prices and adjust the tax rate on the basis of market trends (See Proclamation No. 99/1998 in *Negarit Gazeta*, 4th Year No. 18, 1998).

This proclamation declares that the FOB price (selling price quoted at the port, agreed between the exporter and the customer, and approved by the National Bank of Ethiopia, which excludes freight and insurance costs) is the basis for calculating the tax. The tax rate is set at 6.5 per cent of the FOB price. The issuing of this new law repeals previous Proclamations and Regulations. These include: Transaction Tax Proclamation No. 205/1963, The 'Third Schedule' (export duties) attached to the Customs Tariffs Regulation No. 42/1976, Coffee Surtax Regulations No. 280/1964 and all subsequent amendments as well as Cess on Coffee Exported from Ethiopia, Regulation No. 47/1976 (see Proclamation No 99/98 in *Negarit Gazeta*, 4th Year No. 18, 1998).

Apart from generating foreign exchange to the country, coffee is an important source of tax revenue to the government. For this reason, it is important to examine the impact of the above reform measures on the contribution of coffee to the government revenue. Table 6 shows the type of tax levied on coffee export and their combined contribution to the government revenue. As can be read from Table 6 there are three types of taxes (Coffee Surtax, Coffee Duties and Coffee Cess tax – in the order of their importance) levied on the export of coffee. There is a marked difference in the contribution of coffee to tax revenue in the pre and post-reform periods. In the pre-reform period the contribution of coffee export (leaving the abnormal period of 1990) to total government revenue was around 8 %. This figure has dramatically dropped to an average of about 1 %. This figure includes the abnormal increase in the

contribution of coffee taxes' due to a huge rise in surtax in 1994/95. If this abnormal year is excluded, the average figure would drop to 0.89%.

The tax revenue from coffee export for the post-reform period, notwithstanding its small size compared to the pre-reform period, shows a positive growth trend. This positive trend is largely attributed to the growth in the tax base. Thus, it can be concluded that the immediate effect of liberalization was reducing government revenue dramatically. Although, such a decline might come from a decline in price and quantity supplied, this was not the case in the Ethiopian context. Both quantity and unit price increased during the period under analysis (see Table 10). This definitely had a detrimental effect on the government's ability to provide necessary services. The liberalization advocates argue that this initial drop in revenue will eventually be captured by a surge in the volume of trade in the long run. Although the evidence in Table 6 seems to point to that direction, the figure for the share of taxes from coffee export in total government revenue has been in the vicinity of 1% for a long time.

Table 6. Coffee Taxes in Total Government Revenue (Millions of Birr)

Year	Coffee* Duties	Coffee Surtax	Coffee * Cess & Others	Total tax on Coffee	Total Gov. Revenue	% of Coffee tax in total Gov. Rev. (exc. Grants)
Before Reform						
1982/83	15.2	173.1	0.8	189.1	2183.8	8.66
1983/84	13.2	224	5.1	242.3	2242.8	10.8
1984/85	10.1	152.2	1.2	163.5	2323.3	7.04
1985/86	9.1	236.7	5.8	251.6	2806	8.97
1986/87	12.2	118.1	4.1	134.4	2925.9	4.60
1987/88	10.4	117.4	3.9	131.7	3467.1	3.80
1988/89	11.1	134.8	5.5	151.4	3898.9	3.88
1989/90	13.3	19.4	12.6	45.3	3142.6	1.44
1990/91	7.9	5.6	6.3	19.8	2706.3	0.73
After Reform						
1991/92	2.2	1.4	1.9	5.5	2208.0	0.25
1992/93	6.3	2.7	3.1	12.1	3191.3	0.38
1993/94	13.0	17.5	7.3	37.8	3938.8	0.96
1994/95	11.5	171.4	7.2	190.1	5912.9	3.22
1995/96	14.2	83.2	9.7	107.1	6966.1	1.54
1996/97	17.9	72.9	9.0	99.8	7877.4	1.27

Source: National Bank of Ethiopia, Quarterly Bulletin, Vol.13 No.1, 1997/98 and Various Issues and MEDaC

Note: For the period1982-1988/89 'Coffee Duties' (shaded) appeared as 'Coffee tax' and 'Coffee Cess & others' as 'others'.

4.3 Ethiopia's Export Performance and the Coffee Sub-Sector: Before and After the Reform.

Ethiopia's export-sector is characterized by huge fluctuations of output and price, as well as extreme dependence on a few primary commodities. As can be read from

Table 7, in the last 10 years, the export sector is characterized by over-dependence on a few commodities such as coffee which constitutes nearly an average of 65 percent of export earning, followed by hides and skins. The combined share of six major export items constitute, on average, more than 80 percent of total exports.

Table 7: The Share of Ethiopia's Major Exports in the Total Value of Exports for Selected Years (in Percent)

Year	Live Animals	Haricot Bean	Sugar	Coffee	Hides & Skins	Petroleum & Petrol	Combined Share
Before Reform							
1988	3.4	2.3	1.7	65.0	14.4	3.0	89.9
1989	1.5	1.4	1.8	65.1	14.6	4.0	88.4
1990	1.6	7.0	6.0	44.4	20.5	6.9	86.4
1991	0.4	0.9	0.9	61.6	13.3	0.7	77.8
After Reform							
1992		0.5	0.8	54.4	16.4	6.7	78.8
1993	0.5	1.0	2.5	64.1	16.1	4.0	88.1
1994	0.5	2.5	0.1	65.3	14.3	5.2	87.8
1995	0.2	3.3	-	60.5	12.7	2.7	79.4
1996	0.1	3.6	-	66.5	12.5	3.4	86.0
1997	0.4	2.7	-	65.3	10.1	0.7	79.2

Source: Computed from Data Obtained from Customs Authority

Table 8 shows the annual growth rate of major export items of Ethiopia. The annual growth rates of these major exports are characterized by extreme fluctuations. This is aggravated by the concentration of exports in a few commodities such as coffee which have cyclical and declining world price trends. This is the major factor behind export earning instability in Ethiopia. This in turn has implications for capital formation instability. Weather conditions, production and marketing problems are responsible for such poor performance.

Table 8: Annual Growth Rates of Major and Total Exports (Selected Years, Volume)

Year	Total Exports	Coffee	Annual Growth Rates		Live Animals
			Hides & Skins	Petroleum & Petrol	
Before Reform					
1989	-4.7	21.3	18.8	4.2	-56.4
1990	-7.1	-37.0	-22.5	-3.2	-31.7
1991	-70.9	-20.5	-54.7	-96.2	-89.6
After Reform					
1992	92.5	-14.1	23.2	1715.1	-
1993	19.4	58.9	79.0	2.8	-
1994	46.0	15.0	6.1	41.6	95.2
1995	-27.6	-4.9	3.1	-40.9	-74.1
1996	26.1	44.1	-11.3	7.1	-73.2
1997	7.3	7.7	24.6	-65.1	1389.4
Average Rate of Growth(1989-1997)	*9.0*	*7.8*	*7.45*	*173.9*	*165.7*

Source: Computed from Data Obtained from Customs Authority

When focusing on coffee, actual time-series coffee production data is hard to obtain. Hence, researchers use coffee arrival at the central/terminal markets of Addis Ababa and Dire Dawa as indicators of total supply[6]. Table 9 shows these data in the period before and after the 1992 reform. The data clearly show that there is unprecedented increase in the supply of coffee following the liberalization program. The total supply has reached its historic pick of 165 thousand metric tones in 1996/97. The table also shows that the share of exports in total arrival has shown a declining trend. This is attributed both to a relatively high quality control and a deterioration in quality.

However, the share of exports out of the total arrival, although is showing an increasing trend in the post-reform period, is generally lower when compared to the pre-reform period. In the early days of the reform period this is attributed to low level of exports in absolute terms while the trend in the recent past is attributed to the relative increase, specially compared to the late 1970s to mid 1980s, in total supply. One also notes that domestic consumption is significant in Ethiopia.

[6] However, this is quite a relevant variable for export supply, upon which much of the analysis in this study is made.

Table 9: Coffee Arrival and Approval for Exports (in metric tons)

Year	Arrival for Inspection	Approval for Domestic Sales	Accepted for Export (In Metric Tone)	Accepted for Export (as share of arrival)
Before Reform				
1978\79	102692	2176	83133	81.0%
1979\80	96429	2946	82142	85.2%
1980\81	89006	3843	75447	84.8%
1981\82	91766	4077	80157	87.4%
1982\83	112140	3331	87573	78.1%
1983\84	102432	4849	94957	92.7%
1984\85	70123	3731	66392	94.7%
1985\86	91997	6451	54490	59.2%
1986\87	156295	19955	154066	98.6%
1987\88	64287	2859	53244	82.8%
1988\89	109299	3268	77707	71.1%
1989\90	90650	4498	83251	91.8%
1990\91	77316	2500	53456	69.1%
After Reform				
1991\92	60155	4024	36076	56.0%
1992\93	87669	3290	69263	79.0%
1993\94	113680	n.a.	73004	64.2%
1994\95	102302	n.a.	78420	76.7%
1995\96	141361	n.a.	101823	72.0%
1996\97	165536	n.a.	117979	71.3%
1997\98	na	na	na	
1998\99	na	na	na	

Source: NBE, Quarterly Bulletin, 1998.

Table 10 shows a rather extended version of the export data given in Table 9. The late 1980s witnessed a decline both in volume and unit price of unwashed coffee. This obviously had a depressing effect on value. A similar trend is observed for washed coffee, which is relatively a high quality product.

The period after liberalization is opposite to the situation described above. Both the volume and unit price have shown a sustained upward trend in the post-reform period. This, in particular, is true of the huge growth in the volume of unwashed coffee. A similar trend is also observed for the washed coffee. Thus, following the *before-after* approach it is sensible to conclude that the liberalization carried out have a positive effect on coffee export growth.

Table 10: Volume and Value of Coffee Export by Coffee Year, Washed and Unwashed

Year	Unwashed				Washed				Total (Unwashed + Washed)		
	Qty(Tons)	Value 000 Birr	Unit Value(Birr/ton)	Hypothetical level*	Qty(Tons)	Value 000 Birr	Unit Value(Birr/ton)	Hypothetical level*	Qty(Tons)	Unit Value(Birr/ton)	Hypothetical level*
1976/77	39031	425892	10912	10912	3928	46669	11888	11888	42959	11001	11001
1977/78	68430	527710	7712	7712	5410	51245g	9472	9472	73840	7841	7841
1978/79	75227	492428	6545	6545	7679	51655	6727	6727	82906	6563	6563
1979/80	71563	548158	7660	7660	6944	60213	8671	8671	78507	7749	7749
1980/81	75876	428217	5361	5361	8030	56082	6984	6984	87906	5509	5509
1981/82	69009	410595	5950	5950	10605	41179	5995	5995	79614	6089	6089
1982/83	60657	451225	5594	5594	10111	62618	6223	6223	90768	5664	5664
1983/84	65448	541607	5123	5123	9446	54321	5809	5809	97894	5190	5190
1984/85	58805	369338	6281	6281	10158	69580	5850	5850	68963	6365	6365
1985/86	60759	594270	9781	9781	12431	120928	8728	8728	73190	9772	9772
1986/87	58743	329905	5616	5616	14669	93688	6387	6387	73412	5770	5770
1987/88	69290	449962	6494	6494	13809	105656	7673	7673	83099	6690	6690
1988/89	61648	365270	5925	5925	22374	168124	7514	7514	84022	6348	6348
1989/90	66583	279059	4191	4191	16347	73325	4486	4486	82930	4749	4749
1990/91	39799	180331	4531	4531	11168	63133	5653	5653	50967	4777	4777
1991/92	32766	162420	4954	4954	7334	51678	7046	7046	40100	5336	5336
After Reform											
1992/93	59628	459111	7867	3257	9962	173049	17336	7177	69610	9225	3819
1993/94	70800	796997	11257	4542	9120	171594	18815	7592	79920	12120	4891
1994/95	68843	1608004	23358	7711	10401	290835	27962	9231	79244	23962	7911
1995/96	93512	1511872	16168	5287	13127	255762	19484	6372	106639	16578	5421
1996/97	93809	1909751	20358	6375	17397	409662	23560	7378	111206	20859	6532
1997/98	109555	2271408	20733	6175	15839	514565	38801	11557	125394	23015	6855

Source: Coffee and Tea Authority

* A hypothetical level of price per ton (in Birr) - if there was no exchange rate reform and hence the exchange rate remains at Birr 2.07 per USD

Note
From 1976/77-1992/93 1USD=2.07 Birr
For 1992/93 1USD= 5.00 Birr
For 1993/94 1USD= 5.13 Birr
For 1994/95 1USD= 6.27 Birr
For 1995/ 96 1USD= 6.33 Birr
For 1996/ 97 1USD= 6.61 Birr
For 1997/ 98 1USD= 6.99 Birr
(Exchange rate values are implicit exchange rate: export in Birr as rat

Table 10: Volume and Value of Coffee Export by Coffee Year, Washed and Unwashed

Year	Unwashed				Washed				Total (Unwashed + Washed)		
	Qty(Tons)	Value 000 Birr	Unit Value(Birr/ton)	Hypothetical level*	Qty(Tons)	Value 000 Birr	Unit Value(Birr/ton)	Hypothetical level*	Qty(Tons)	Unit Value(Birr/ton)	Hypothetical level*
1976/77	39031	425892	10912	10912	3928	46669	11888	11888	42959	11001	11001
1977/78	68430	527710	7712	7712	5410	51245g	9472	9472	73840	7841	7841
1978/79	75227	492428	6545	6545	7679	51655	6727	6727	82906	6563	6563
1979/80	71563	548158	7660	7660	6944	60213	8671	8671	78507	7749	7749
1980/81	79876	428217	5361	5361	8030	56082	6984	6984	87906	5509	5509
1981/82	69089	410595	5950	5950	10605	41179	6995	6995	79614	6089	6089
1982/83	80657	451225	5594	5594	10111	62618	8223	8223	90768	5664	5664
1983/84	88448	541607	6123	6123	9446	54321	6809	6809	97894	6180	6180
1984/85	56805	369338	6261	6261	10158	69580	8650	8650	66963	6365	6365
1985/86	60759	594270	9781	9781	12431	120926	8728	8728	73190	9772	9772
1986/87	58743	329905	5616	5616	14669	93688	6387	6387	73412	5779	5779
1987/88	69290	449962	6494	6494	13809	105656	7673	7673	83099	6690	6690
1988/89	61648	365270	5925	5925	22374	168124	7514	7514	84022	6348	6348
1989/90	66583	279059	4191	4191	16347	73325	4486	4486	82930	4749	4749
1990/91	39799	180331	4531	4531	11168	63133	5653	5653	50967	4777	4777
1991/92	32766	162420	4954	4954	7334	51678	7046	7046	40100	5336	5336
After Reform											
1992/93	59628	459111	7867	3257	9982	173049	17336	7177	69610	9225	3819
1993/94	70800	796997	11257	4542	9120	171594	18815	7592	79920	12120	4891
1994/95	68843	1608004	23358	7711	10401	290835	27962	9231	79244	23962	7911
1995/96	93512	1511872	16168	5287	13127	255762	19484	6372	106639	16576	5421
1996/97	93809	1909751	20358	6375	17597	409682	23560	7378	111206	20859	6532
1997/98	109555	2271408	20733	6175	15839	514565	38801	11557	125394	23015	6855

Source: Coffee and Tea Authority

* A hypothetical level of price per ton (in Birr) - if there was no exchange rate reform and hence the exchange rate remains at Birr 2.07 per USD

Note: From 1976/77-1992/93 1USD=2.07 Birr
For 1992/93 1USD= 5.00 Birr
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For 1995/ 96 1USD= 6.33 Birr
For 1996/ 97 1USD= 6.61 Birr
For 1997/ 98 1USD= 6.99 Birr
(Exchange rate values are implicit exchange rate: export in Birr as rat

Table 11 shows the share of Ethiopia's export in the world coffee market. It shows that Ethiopia's share in the world market is in the vicinity of 2 %. Observed in the range of the entire period, this figure has shown a declining trend. It showed a small decline in late 1980s and early 1990s, and reached its lowest in 1991/92 (the period of change in government). Following the 1992 liberalization Ethiopia's share in the world market has shown some signs of recovery, although the historic maximum figure of 2.5 % (which was achieved in 1980/81) is not attained yet. This low share of Ethiopia's export in the world coffee market is partly attributed to the growth in the world supply of coffee not only from the traditional major suppliers such as Latin American (Brazil, Colombia etc) and African (Uganda, Cote d'Ivoire etc) countries but also new entrants into the market from Asia.

Table 11: Ethiopia's Share in the World Coffee Trade under International Coffee Agreement (In Metric tons)

	Exports of All Members to All Destinations [2]	Exports of All Members to Quota Markets [3]	Exports of Ethiopia to All Destinations [4]	Exports of Ethiopia to Quota Markets [5]	[4] as % of [2]	[5] as % of [3]
Before Reform						
1978/79	3887100	3518100	82906	63415	2.13	1.80
1979/80	3674640	3302280	78507	59728	2.14	1.81
1980/81	3567900	3083220	87906	72029	2.46	2.34
1981/82	3812040	3271440	79614	73676	2.09	2.25
1982/83	3943860	3305880	90768	80453	2.30	2.43
1983/84	4201080	3596100	97894	86991	2.33	2.42
1984/85	4136640	3447540	68963	59438	1.67	1.72
1985/86	4132740	3716220	73190	64844	1.77	1.74
1986/87	4383360	3925260	73412	66447	1.67	1.69
1987/88	3730560	3077040	83099	74576	2.23	2.42
1988/89	4302600	3497520	84022	77891	1.95	2.23
1989/90	4870260	4209900	82930	71197	1.70	1.69
1990/91	4458720	3806640	50967	47518	1.14	1.25
After Reform						
1991/92	4668300	3976608	40120	31149	0.89	0.08
1992/93	4670700	3912480	69610	60629	1.49	1.55
1993/94	4317600	3588660	79920	58447	1.85	1.63
1994/95	3826620		79244	63751	2.07	
1995/96	Na	na	Na	na		
1996/97	na	na	Na	na		

Source: Coffee and Tea Authority, 1996

In terms of the destination of exports the bulk of Ethiopia's exports are destined to industrialized countries (Germany, USA, Italy, France, UK, Japan) and Saudi Arabia in Asia, in particular. This pattern seems to remain unchanged over the past ten to fifteen years. The only exception could be the increasing importance of Asian countries (in particular Japan and Saudi Arabia). The data also show that a few countries such as Germany, Japan and Italy and recently Saudi Arabia are increasingly becoming important destinations to exports from Ethiopia. Figure 4 below shows the export market destination for 1997 (the latest available figure). The figure clearly shows the dominant position of Germany.

Figure 4: Export Market Destination for Ethiopia (1997) [See Table 12]

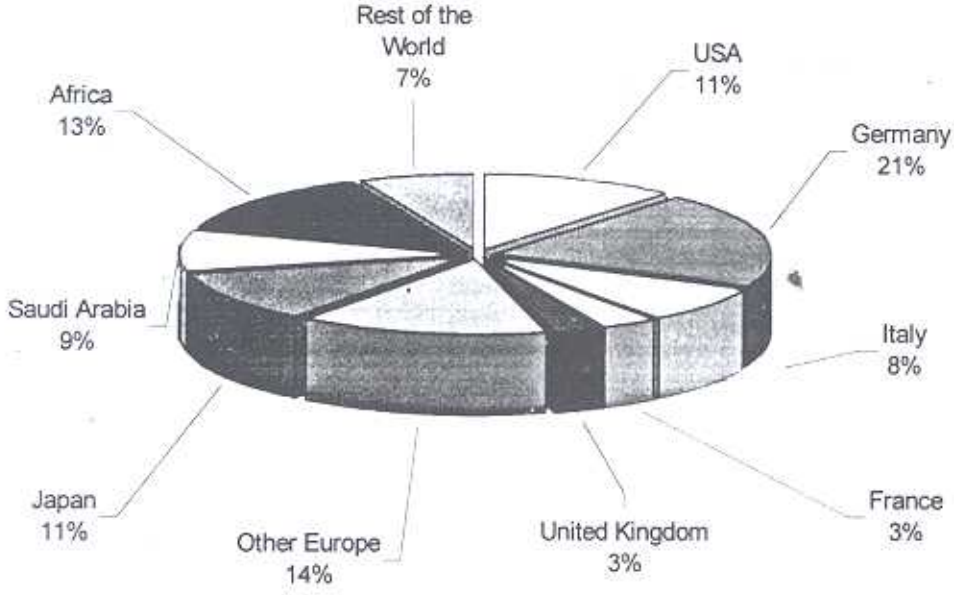

Table 12 shows the need to increasingly diversify the destination of exports so as to avoid over-dependence on few countries.

Table 12: Share of Total Exports by Destination (1989-1997)

	Share of Total Exports (1988/89)	After Reform: Share of Total Exports (1992-97)					
		1992	1993	1994	1995	1996	1997
USA	12.4	3.9	9.1	6.5	6.4	6.1	11.4
Germany	23.2	9.7	19.7	31.7	29.1	29.7	20.6
Italy	6.5	6.5	7.6	8.1	8.6	7.4	7.8
France	4.9	5.0	3.7	4.9	5.0	3.4	3.2
United Kingdom	1.9	16.3	4.6	3.5	3.6	3.1	2.9
Other Europe	-	5.1	6.7	5.8	6.4	7.2	14.3
Japan	15.1*	21.5	19.0	14.5	13.0	12.0	11.2
Saudi Arabia	15.1*	20.1	9.9	5.3	9.0	10.6	8.6
Africa **		7.2	13.4	9.1	11.5	12.4	13.2
Rest of the World	-	4.8	6.3	10.5	7.3	8.0	6.8
Total		**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

* The combined figure for Japan and Saudi Arabia is 15.1%.
** Predominantly Djibouti (and recently Sudan and Egypt).
Source: Computed from National Bank of Ethiopia. Quarterly Bulletin, 1997/98.

5. SUPPLY RESPONSE AND THE IMPLICATION FOR FOOD SECURITY

5.1 Supply Response: The Macro and Econometric Evidence, A Brief Outline

The analysis in section four shows the impact of Ethiopia's liberalization program in the coffee sub-sector using the before and after approach. In section four we have used various macro data sets to see if there is any change before and after the reform period. The broad conclusion drawn from that section is that the liberalization in Ethiopia is associated wtih positive performance (except in contribution to government revenue) in the coffee sub-sector as measured by export supply, quality of export (washed and unwashed), area under cultivation etc. In this section we will explore the available micro/econometric evidence about the supply response and attempt to relate it to the issue of food security. The econometric evidence is compiled based on research carried out at the Department of Economics of Addis Ababa University.

The Econometric /Micro/ Evidence

In the absence of a survey focused on the coffee sector, we have resorted to a review of micro-based econometric research carried out in some of the coffee producing areas[7].

Taye (1997) made an econometric analysis of the coffee supply response to the liberalization or reform undertaken in Ethiopia. His analysis is based on a sample of farm households drawn from two districts (Gomma and Manna) of the Jimma region. According to his finding there is a micro level evidence that following liberalization there is an increase in movement of resources to the coffee sub-sector. This is shown by the fact that area under coffee cultivation in the two districts, number of coffee seedlings, hired labour and frequency of weeding as well as coffee yield increased (Taye, 1997: 92; See Table 13 below). Given the coefficients of 0.48 for land and 0.22 for labour in the coffee production function estimated by the author using a log-linear Cobb-Douglas production function, this shift in resources has definitely contributed to increase in the supply of coffee. Moreover, given the shortage of the two important factors of production (labour and land) in the study area, this shift must have occurred at the expense of food crops production.

Table 13: Resource Shift Effect in Sample Households of Taye's Study

	Pre-Reform	Post-Reform
Area under Coffee (ha)	0.4867	0.6265
Coffee Seedlings (no.)	201.00	497.61
Hired Labour (MDs)	19.19	30.49
Wedding (frequency)	2.20	3.08
Coffee Yield (kg/ha)	425.35	452.51
Spraying against CBD (kg)	18.10	2.06

Source: Survey Data of Taye (1997).

Taye's finding noted above has implications for food security, especially in the light of his other two findings: (a) land and labour are important resources with positive marginal and average product and (b) that the estimated marginal values of using land (216.96 kg per ha) is nearly equal to the value of food crop (maize) forgone – thus there is allocative efficiency. The implication is that in the context of the existing market structure it is rational for the peasants to substitute coffee for food crops. That was exactly what the peasants were doing. This brings us to the question of whether countries such as Ethiopia which are dependent on volatile world coffee market could afford to forgo 'food sovereignty' by relying on the possibility of ensuring food security

[7] The Department of Economics of AAU has also compiled a longitudinal data of both urban and rural households. If that data can be systematically compiled and analyzed it would have given more insight. Again this is both time and resource consuming. Future studies in this area can bring about value added to issues discussed in this paper.

through higher export earnings – trade-based food security. The evidence noted thus far in this paper is not encouraging to pursue the latter option.

Another micro-based econometric study is Abdurahman's work (1995) on two districts in Hararghe highlands - another important coffee growing area. In this area average holding of the peasants is divided into 53 % for maize and sorghum (major food crops in the area) and an average of 30 % for coffee and *chat*. Using a survey data of two districts he found strong short-run (two years) supply price elasticity value of 0.60, which is statistically significant. He convincingly argued that this short-run response is attributed to marketing efficiency following liberalization, reallocation of labour to the cash crop sector and a shift of supply from smuggling to the formal channels. The finding about the latter is also in line with the study of Dercon and Lulseged (1994) about coffee smuggling, although Dercon and Lulseged argued that the effect of the parallel market is not as large as sometimes thought (Dercon and Lulseged, 1994: 71). Dercon and Lulseged (1994) noted that following devaluation there was a rising trend in coffee production although the increase was not large. The latter is partly attributed to the relative high price of other competing crops such as *chat*.

Abdurahman (1995) also found that land and labour are the most important constrains to production in the region. The positive supply price elasticity, acute shortage of land and labour and the food problem in the area demonstrate the limitation of using export earning to ensure food security. The study area is a food shortage area. Traditionally farmers engaged in cash crop production such as coffee and *Chat* used to buy cereals/grain from other localities. The study by Abdurahman (1995) shows that peasants in the study area are food insecure and are dependent on precarious regional food markets/flows. Thus, even if one has the capacity to buy food crops from the earnings obtained by selling coffee, food security for that group of farmers is dependent on the sustained existence of the regional food market/food flow. Abdurahman (1995) also noted that, after liberalization the terms of trade have moved against the agricultural sector in general and food production in particular. This had a disincentive effect on the food production (Abdurahman, 1995: 57-58).

Another study by Yoseph (1994) that is based on a survey conducted in Gomma district in Jimma region also confirms the importance of land and labour as crucial inputs in coffee production. Yoseph's study shows that the supply price elasticity is not really important (in the range of 0.14 using a log-log model and statistically significant only at 13%). Rather an interesting finding of Yoseph is that in the sample area coffee producers spend 91.3% of their earning from coffee on food crops. Moreover, in the period from 1992/3 to 1993/4 the price of food crops (maize and sorghum) increased by 11% while that of coffee by 61%. This certainly entails a huge incentive to shift to coffee production if only to spend the bulk of this earning on food crops. Here, although food security may be attained at the household level indirectly (and hence sidestep the principle of 'food sovereignty') it is not dependable owing to volatile world coffee market and poor regional food market.

5.2 The Uruguay Round (The Agreement on Agriculture), Supply Response and Food Security

The rather delicate relationship between 'food security' and trade has attracted the attention of governments in developing countries, multilateral institutions and non-governmental organizations. Trade-based food security (imports of food paid by exports) has become an accepted norm in many multilateral circles. Many others (including some NGOs) question such an approach and opt for 'food sovereignty' instead. The latter implies introducing the elements of national-decision or policy making into food security. The issue of 'food sovereignty', as opposed to trade-based food security, has also supporting micro explanation that warrants its capacity to ensure household food security. There is evidence that a strong correlation exists between household food security and the proportion of food consumption, which is home produced. This is because women have control over the use of food crops and men on cash crops. Unless the increase in income from coffee is very high to offset the negative control effect, there could be problems to ensure food security based on earnings from cash crop production (Westlake, 1999: 29).

When a country relies on trade-based food security its actual food security will extremely be dependent on international trade (especially prices). In the Ethiopian context trade-based food security could be justified if only the international market for coffee is promising. A study commissioned by the Ethiopian government to design a 'strategy for development of the coffee sector' noted that there is no prospect of price rise for coffee in the coming 20 to 25 years. Moreover, the world coffee market is being characterized by a huge volatility (price in 2002 being substantially declining from a pick in 1996) (See Westlake, 1999). Trade-based food security is also dependent on the rules that govern international trade such as the Uruguay Round Agreement on Agriculture (UR-AoA). The AoA includes, *inter alia*, issues of increased market access, domestic support for farmers, food security, environmental protection and the like.

Although the AoA gives developing countries longer time to implement commitments, it is expected that most developing countries will be dependent on food imports due to higher productivity, protective policy practice as well as distortion effect of stocks in the developed countries. In 1983 for instance the Common Agricultural Policy of the European Union cost 70-75% of the entire EU budget, 50% of which was spent on handling surplus production. This ensures cheaper food supply which could crowd-out food production in developing countries.

Given the rather uncertain nature of dependence on trade-based 'food security' it is worth examining the trend of domestic production and food import in Ethiopia. Tables 14 and 15 show area under major crops for private peasant holdings, which constitute nearly 97% of total crop output and 98% of coffee production, in both pre and post-reform periods. The trend of area under major crops shows that although it is characterized by a huge annual fluctuation, it has increased in the post-reform period

(from negative growth rates in the pre-reform period to a positive one in the post-reform period). Table 16 shows a similar pattern in output. Thus, notwithstanding the micro evidence of substitution of land under food-crop production for coffee, the macro data shows an increase both in area under cultivation and total output. This could be attributed, assuming the macro data is reliable, both to an increase in the size of total holding and/or a rise in productivity.

Despite the increase in the domestic production, food imports (See Table 17) constitute the fourth important item in the total imports of the country. The share, although varies annually (the highest figure being registered in drought years), has not fundamentally changed in the post-reform period. Moreover, the country is dependent on food aid. Over the period 1985-1996, the annual volume of cereal food aid varied from 2.3 to 26% of total domestic production. In a typical year the volume of cereals food aid can account for up to 25% of the marketed surplus (MEDaC, 1999: 2000). Both imports and food aid have price depressing, and hence negative incentive, effect on domestic production. The government is however attempting to tackle the food aid impact by efficient targeting of the needy (MEDaC, 1999:2000).

Table 14: Area Cultivated under Major Crops for Private Peasant Holdings (Both Seasons, in '000 ha)

Year	Cereals	Pulses	Oilseed	Total
Before Reform				
1984/85	4553.81	738.98	264.37	5557.16
1985/86	4666.80	668.24	275.36	5610.40
1986/87	4642.80	599.24	208.45	5450.49
1987/88	4915.40	729.00	185.10	5829.50
1988/89	383.14	37.88	17.20	438.04
1989/90	4851.10	627.96	220.94	5700.00
1990/91	4199.00	701.90	244.00	5144.90
After Reform				
1991/92	4087.00	683.15	237.47	5007.62
1992/93	7740.50	1032.6	373.33	9146.43
1993/94	6107.70	867.47	322.12	7297.29
1994/95	6448.50	919.57	342.03	7710.10
1995/96	7670.55	1005.67	394.36	9070.58
1996/97	7436.97	1012.26	484.51	8933.74
1997/98	6619.70	938.88	416.00	7974.58

Source: Ministry of Economic Development and Cooperation (MEDaC), 1999.

In sum, the macro evidence given in this section shows an increase in the production of food crops as well as imports and food aid. The latter two, through their price depressing effect, could bring detrimental effect on domestic production. This is especially important in the light of the micro evidence of supply response discussed in the previous section. What would be the net effects of these two opposing

tendencies? This is an empirical question that needs further investigation using carefully drawn macro and micro data.

Table 15: Trends in Area Cultivated Under Major Crops (1980/81 - 1997/98) Period Growth Rates

Crop Type	Before Reform 1980/81-1990/91	After Reform 1991/92-1997/98	Average 1980/81-1997/98
Cereals	-6.6	5.7	3.4
Pulses	-9.3	3.8	2.3
Oil Seeds	-6.4	8.6	4.6
Total	-6.9	5.6	3.3

Source: Ministry of Economic Development and Cooperation (MEDaC), 1999.

Table 16: Estimates of Production of Major Crops by Private Peasant Holdings (Both Seasons, in '000 Quintals)

Year	Cereals	Pulses	Oilseed	Total
Before Reform				
1984/85	38727	4838	1046	44611
1985/86	44278	4605	1153	50036
1986/87	62775	5741	1089	69605
1987/88	59570	5640	881	66091
1988/89	57472	5953	891	64316
1989/90	61383	6749	983	69115
1990/91	57131	9968	3141	70240
After Reform				
1991/92	55603	9702	3057	38362
1992/93	70639	8425	1240	80304
1993/94	61912	7501	1107	70520
1994/95	65891	7947	1172	75010
1995/96	92654	8662	1963	103279
1996/97	93591	8609	2168	104368
1997/98	74349	7323	1817	83489

Source: Ministry of Economic Development and Cooperation (MEDaC), 1999.

Table 17: Imports by Commodity Categories

Year	Food	Textiles	Machines. & Transport Equip.	Manufactured Articles	Petroleum Product	Others	Total Imports (In Million Birr)
Before Reform							
1986	21.4%	1.5%	32.2%	22.6%	9.1%	13.2%	2278.7
1987	10.8%	1.7%	41.7%	24.6%	10.4%	11.4%	2279.4
1988	14.5%	0.8%	29.9%	21.1%	9.9%	14.8%	2246.0
1989	8.7%	1.7%	33.6%	31.9%	11.3%	12.9%	1967.2
1990	12.5%	2.0%	na	23.6%	11.9%	12.6%	2225.7
1991	4.0%	3.0%	38.8%	25.2%	19.3%	9.7%	1081.7
After Reform							
1992	11.4%	4.9%	24.7%	17.0%	30.4%	11.7%	2251.8
1993	10.8%	2.3%	24.7%	31.0%	25.8%	5.5%	4074.9
1994	18.4%	2.7%	25.9%	22.2%	22.7%	7.6%	6147.0
1995	11.2%	2.6%	30.5%	20.2%	22.6%	12.9%	8086.6

Source: Computed from Customs Office Data

6. CONCLUDING REMARKS AND POLICY IMPLICATIONS

In this study an attempt is made to examine trade liberalization and its implication for the coffee sub-sector. The study is largely based on 'the before after approach' which is chosen for its simplicity. Using this approach the data in pre and post- reform period are examined. The following are the main conclusions and policy implications that are drawn from the study.

First, trade liberalization, which is one component of the Ethiopian government's Structural Adjustment Policy, has led to an increase in the level of export (both in quantity and quality), area under coffee cultivation, private sector participation both in the process and marketing of coffee. The rise in proceeds from coffee export is also found to be chiefly due to the liberalization of the foreign exchange market. Although by 1994 world price of coffee had increased and perhaps accentuated the positive impact of the exchange rate policy pursued, the pure world price effect in raising the income of coffee producers would not have been as high as what it were had it not been for the exchange rate policy.

Second, this liberalization scheme, however, does not show that SAP (or the AoA, which has a similar effect) has enhanced the competitiveness of Ethiopia's coffee in the international market. Ethiopia's share in the world market is still too small (around 2%) to bring about such an effect. In fact, most micro evidences examined in this study show that the price elasticity is either small or statistically insignificant. This

may point to the fact that price liberalization by itself may not bring about major changes in the coffee sub-sector and, hence, needs to be accompanied by supply side policies.

Third, the volume of export, prices and farm income derived form coffee are largely dependent on both national and international trade policies. Thus, government policy of liberalization in the sector as well as the reduction of coffee taxes were very important. However, this does not necessarily imply that the country would benefit from the international market. In fact, the evidence in this study shows that the world coffee market is volatile and with no prospect for a rise in prices. The latter points to the danger of relying on the international market to ensure food security.

Fourth, some of the micro evidences show that even if peasants' earnings from cash crop could increase following liberalization, effective access to food depends on the efficiency of inter-regional trade in food. This requires government investment in infrastructure and efficient information & marking system to help ensure national food security.

Five, one of the potential impacts of liberalization schemes such as SAPs, WTO or AoA is dumping. Dumping could reduce domestic food production. In Ethiopia, the increasing trend of food imports and food aid need proper management and sensible intervention by the state so as to avert its potential detrimental impact on domestic food. Concrete policy implications here could be efficient targeting of the needy regarding food aid and domestic support or protection of peasants against the detrimental impact of food imports.

Six, trade liberalization in the coffee sub-sector has also resulted in the decline in the share of taxes on exports in total government revenue. This suggests the possibility of a transfer of resources from the government to the private exporters. It is worth examining the opportunity cost of this fund when used under the public or the private sector.

Seven, since countries such as Ethiopia are price takers in the international commodity market, global liberalization by all developing countries implies a relative increase in global supply which in turn depresses export earning and, hence, the weakness of 'trade-based food security'. This has the policy implication of either strengthening collective action to fight against the price taker position or resort to 'food sovereignty' by collective negotiation on the rules of the global market such as AoA.

Finally, an in-depth study using micro evidence about farm-gate price, resource substitution and food market efficiency, among others, is required to come up with much more micro focused policy implication.

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