

The Impact of Aid for Trade in Ethiopia: A CGE-based Simulation Analysis

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Abstract

Depending on the nature of the aid and the characteristics of the economy, aid and trade can either reinforce or counteract each other in fostering economic development. This paper contributes to the ongoing debate on the interaction between aid and trade by analysing the impact of aid for trade (A4T), which involves different interventions in support of the supply side of the economy.

Using computable general equilibrium (CGE) simulations developed around a recently completed social accounting matrix (SAM) for Ethiopia, the impact of different types of A4T interventions have been analysed. The simulations, which are run in both static and dynamic models, reveal how Dutch disease effects of aid can be ameliorated through A4T policies and taking account of their supply side effects. The results suggest that, if appropriately designed, aid need not be in conflict with trade objectives.

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1. Introduction

The interaction of aid and trade, two of the most important external forces that can generate development, is the subject of continuing debate. Depending on the nature of the aid and the characteristics of the economy, aid and trade can be partners or rivals.²

The most commonly cited negative effect of aid is Dutch disease, whereby the inflow of foreign currency appreciates the exchange rate making exports less competitive abroad. On the other hand, aid can positively influence export capacity through its impact on the supply-side of the economy. Indeed, donors are increasingly considering export promotion as part of their strategies, often referred to as aid for trade (A4T), and there are calls for this to become a higher priority (such as in Stiglitz and Charlton, 2006).

Using a model of the Ethiopian economy, this paper attempts to shed some light on the conditions under which aid can assist or damage a nation's exports, highlighting the policy implications. The paper is organised as follows. Section two reviews the interaction of aid and trade, as well as the specific concept of A4T, and section three offers a brief outline of the barriers to trade in the Ethiopian economy. The data and modelling framework is given in section four, with the simulations in section five. Section six shows the results of both the static and dynamic models. Section seven concludes, suggesting policy implications and recommendations for future development of the research.

2. Aid, Trade and Aid for Trade (A4T)

This section firstly addresses the channels through which aid can impact on trade, emphasising the circumstances under which that impact can be positive. In light of this, the section explains the growing role of donors in trade issues and the specific notion of aid for trade (A4T).

The most frequently noted effect of aid on trade is the phenomenon of Dutch disease, whereby an inflow of foreign exchange (in this case, from aid flows), increases the demand for the local currency, causing an appreciation, which makes exports less competitive on world markets. The notion is well-established in theory and observed empirically.³

The Dutch disease phenomenon relies on the effect that aid may have on the demand side of the economy. These considerations can be balanced by effect that aid has on the supply side, which under plausible conditions can outweigh the simple Dutch disease effects.^{4 5} The many channels through which aid can impact the supply side of the economy can be categorised as follows:

² A discussion can be found in Page (2006).

³ For example, Rajan and Subramanian (2005) find evidence of aid causing Dutch disease using cross-country regression analysis.

⁴ Adam and Bevan (2006) investigate this in a stylised model, loosely based on Ugandan data.

(1) *Raising productivity overall.* Aid may raise productivity in the economy as a whole, boosting exports sufficiently to outweigh the reduction in exports from an appreciating exchange rate. For example, this could occur through improved infrastructure or streamlining bureaucracy.

(2) *Raising productivity of nontradables.* The typical Dutch disease story can be told with respect to the tradable and non-tradable sectors of the economy. The increase in foreign exchange availability makes tradable goods more abundant in the economy. Any increase in spending on domestic goods must come from domestic producers switching from producing tradables to producing non-tradables, which they would be induced to do those a rise in the relative price of non-tradables to tradables, which means an appreciation (Bevan, 2005:10). However, were aid to be spent in such a way as to boost the productivity of the non-tradable sector (perhaps through assistance to domestic agriculture, etc), the increase in the supply of non-tradables could offset the increase in demand (ibid.:11).

(3) *Raising productivity of exports.* If, on the other hand, aid is focused primarily at raising the productivity of exportables, the real appreciation may be even greater than from the Dutch disease effects alone. Nevertheless, despite the lower price received for exports (in local currency), exports may yet increase if productivity has been sufficiently enhanced to result in higher profitability (ibid.).

(4) *Reducing underemployment.* Policy is not simply a matter of “smoothing a fairly regular [business] cycle,” rather that “market inefficiencies permit there to be sustained pockets of reduced activity, and also that there are large shocks which induce extended periods of disequilibrium” (ibid.:11-2).⁶ Aid may help to reduce this underemployment of factors.

Through the 1990s, some major donors reduced their activities in trade believing that widespread tariff reform would adequately integrate developing countries into the world market (IMF/World Bank, 2007:16-7). The limited success of tariff reform alone has moved the discussion towards other impediments to trade, including:

- weak infrastructure
- weak institutions
- poor knowledge of market opportunities
- limited capability to meet high standards in export markets

Such impediments to trade are precisely the areas that successful A4T interventions could tackle, and indeed donors have begun to shift their focus in this direction.

At this point, it is necessary to define more precisely what constitutes an A4T intervention. The commonly accepted definition of the Bank and the Fund encompasses five main activities:

⁵ Killick and Foster (2007) discuss the challenges in realising positive supply side policies.

⁶ The point regarding under-utilised capacity was made with respect to Ethiopia by a World Bank economist in an interview with the author in March 2007.

- *Technical assistance*: the provision of technical assistance, advice, and expertise to assist countries confronted with the complexities of modern trade.
 - *Capacity building*: building the capacity of developing countries to deal with trade issues, for example, through the training of government officials.
 - *Institutional reform*: helping to create a framework of sound and well-functioning institutions for trade—in customs, quality assurance, and other areas.
 - *Infrastructure*: improving roads and ports to link the poor and the goods they produce to markets through investment in infrastructure.
 - *Assistance with adjustment costs*: fiscal support and policy advice to help countries cope with any transitional adjustment costs from liberalization.
- (IMF/World Bank, 2005:3)

It is apparent that many A4T elements are part of a common donor expenditure portfolio, and naturally, there are some inherent difficulties in drawing a line between A4T and non-A4T flows. Nevertheless, in order to get a picture of how much donors focus on A4T at the present time, an IMF/World Bank report (2007:10), using a broad definition estimated that A4T commitments amounted to \$25 billion annually for the years 2002 to 2005, which was roughly 40 percent of all ODA excluding debt relief. Looking at the components of this figure, around \$10 billion (40 percent) of this is spending on infrastructure and \$5 billion (20 percent) is budget support. Focusing specifically on A4T in Ethiopia, a separate report (which uses a *narrower* definition of A4T) estimated that 42 percent of *sectoral* ODA to Ethiopia could be classified as A4T (OECD&WTO, 2007a:27-8).

Due to the fact that there are calls for an even greater focus and additional funds to be directed towards an A4T agenda⁷ and the complex mechanisms in operation, it is important to investigate the impact that A4T might have. Focusing on Ethiopia, the paper introduces a model and simulations to address this issue and takes into account the specific barriers to trade Ethiopia faces, which are outlined in the next section.

3. Impediments to Trade in Ethiopia

Ethiopia is a largely agrarian economy, with agriculture accounting for around half of national income and 80 percent of employment (Ferede, 2008). The bulk of the population are smallholder farmers, and it is estimated that 87 percent of rural households rely on subsistence agriculture as their main source of income (World Bank, 2006:5). Food availability and food security are major concerns with estimates suggesting that 44 percent of the population is undernourished (Nega et al., 2003).

Utilising the SAM-based characterisation of the economy in 2001/02 (see section 4 below), one sees that exports account for 12.5 percent of GDP (at market prices), with imports accounting for 27.7 percent. The major exports are coffee, transport services, business services and public administration services, though the majority of commodities have little or no exports.⁸

⁷ Such as Stiglitz & Charlton (2006), who propose that 7 percent of foreign aid be allocated to a Global Trade Facility.

⁸ The SAM disaggregates commodities into 61 categories. Of these 61, 37 commodities export less than one percent of output. (These 37 commodities represent 63 percent of the total value of aggregate demand.)

Since the overthrow of the socialist Mengistu regime in 1991, the EPDRF, led by Meles Zenawi has been in power. During this time, the government has moved towards greater marketisation of the economy, though not without reticence in some areas. In recent years, the rhetoric has been much more that of becoming a ‘developmental state,’ closer to an East Asian model, including *the state being actively involved in export promotion* (e.g. Zenawi, 2006). The leather industry in Ethiopia is an example where manufacturers of exported goods were given state-funded training and assistance to move up the value chain (ibid.).⁹

Economic development has been hampered by the conflicts fought both within its borders and with both Somalia and Eritrea. Relationships with these two neighbours remain precarious, resulting in only available sea port being in Djibouti. This situation is reflected in Ethiopia’s low ranking in the ‘trading across borders’ category of the World Bank’s Doing Business Project (31st out of 46 in sub-Saharan Africa).¹⁰

Numerous other constraints on exports, and indeed the development of the economy as a whole, can be identified. Regarding infrastructure, road density is low by sub-Saharan African (SSA) standards, as is electricity generation, telephone penetration, improved water supplies, health infrastructure and education infrastructure (details given in Seyoum and Ferede, 2004:11-12). Skilled labour is another constraint, low literacy rates being indicative of a wider educational deficit.¹¹

Many of these constraints could, potentially, be addressed by external support. Considering both the economic and political climate, A4T could play a significant role in Ethiopia.

4. Data and Modelling Methodology

This paper uses a social accounting matrix (SAM) for Ethiopia recently completed in a collaborative project between the Ethiopian Development Research Institute, the Institute of Development Studies, and the Universities of Sussex and Sheffield. The SAM was based upon data from a household survey, an agricultural census, labour survey and industry surveys from the Central Statistics Agency (CSA), with further data gathered from the Ministry of Trade and Industry (MOTI) and the Ministry of Finance and Economic Development (MOFED). The SAM used in this analysis has been slightly adapted.¹² A full list of SAM agents is given in Appendix One.

⁹ The government has even *forced* manufacturer to move up the value chain by banning the export of raw hides and skins.

¹⁰ It should be noted however that generally the Doing Business Project ranks Ethiopia fairly highly: 9th out of 46 in SSA in ‘overall ease of doing business’. www.doingbusiness.org Accessed March 2008.

¹¹ Literacy rates are rising, but despite this, recent data records adult literacy at 36 percent, compared with an SSA average of 59 percent (World Bank, 2007:334).

¹² Specifically, the original 42 activities have been aggregated into 26 sectors, one of the 62 commodities has been aggregated leaving 61, the three types of skilled labour have been aggregated together, the 17 tax types have been placed into four groups, and trade & transport margins have been split into those applicable to exports, imports and domestically-produced commodities.

On the production side, 26 activities produce 61 commodities. Some of this production (around 6 percent) goes straight to households (i.e. home production for home consumption). Since trade and transport services are used to market output, the cost of these services, together with consumption taxes, represents a wedge between producer and purchaser prices.

Three factors of production are specified: unskilled labour, skilled labour and capital (returns to land have been combined with returns to capital). These factors pass on all of their payments to households (with the exception of a small payment abroad from foreign-owned capital). In turn, households are split into two categories: urban and rural. Almost all (98 percent) of rural household income is derived from these factor payments, which, though still constituting the largest proportion of urban households' income (90 percent), the remaining 10 percent is derived from transfers from government and the rest of the world. On the expenditure side, home production is important for rural households, providing 27 percent of expenditures, though for urban households a mere 1 percent of expenditure is accounted for this way. Savings rate are similar at around 18 percent for both types of household.

Government is funded through four types of taxation (commodity taxes, import taxes, institutional taxes and a small export tax levied on coffee) and also receives transfers from the rest of the world, which account for 32 percent of the budget. Government expenditure is split into spending on public administration services (66 percent), education services (18 percent), health services (4 percent) and transfers to households (14 percent). There is also a small amount of dissaving (3 percent).

The first model employed is a comparative static type derived from the IFPRI standard model as described in Lofgren et al. (2002), which has been adapted to allow for factor-specific technical change. A balanced closure was chosen that ensures that the share of consumption, investment and government remain the same in nominal terms.¹³ Capital is deemed to be activity specific and fully employed (rents are flexible). Skilled labour is also fully employed (skilled wages are flexible), but is mobile across activities. Unskilled labour is deemed to be in excess supply (wages are fixed) and is also mobile across activities.

The second model is a recursive dynamic model, also derived from the IFPRI standard model. Again, a balanced closure ensures that the share of consumption, investment and government remain the same in nominal terms. All factors are deemed to be fully employed, with wages/rents flexible.¹⁴ The exception to this is the mining activity, where capital and skilled labour are assumed to be fixed.

The dynamic model includes some assumptions about exogenous annual changes. Both the population and the labour force grow by 2.5 percent per year. Investment is made in the capital stock, dependent on the rate of return to each activity. The depreciation rate is taken to be 6 percent. Total factor productivity (TFP) is assumed to grow at one or two percent per year, depending on the activity. These changes combine to make a modest growth rate in the base run, to which additional considerations of the simulations below are added.

¹³ Small changes in the real growth rates in the tables below are the result of relative price changes.

¹⁴ Unlike the static model, this includes unskilled labour. It is argued that this is a better assumption over a longer time period.

5. Simulations

Similar simulations were run in both the static and dynamic models to allow for comparisons to be made. In this section, the static simulations will be described first in some detail, following by a description of how these simulations were adapted to fit into the dynamic analysis.

To analyse A4T in Ethiopia, nine simulations are run, all of which include an increase in aid of 3 percent of GDP. As transfers from the rest of the world to government in the SAM stand at 5.8 percent of GDP, this represents an increase of slightly more than 50 percent, which is a plausible magnitude. This section explains why each of these nine simulations were chosen.

Recall from Section 2 that there are five elements in the definition of A4T: technical assistance, capacity building, institutional reform, infrastructure and assistance with adjustment costs. Table 5.1 lists these categories, proposes interventions that could be attempted, lists what a successful result would be and, lastly, how this is entered into the model. As this table outlines the justifications for the simulations carried out, it is worth going through in some detail.

Taking the first two categories, *technical assistance* and *capacity building*¹⁵, the first intervention proposed is an A4T programme that improves knowledge of foreign markets. If successful, such a programme would locate markets for Ethiopian products that exporters had not yet tapped, the result being a shift in the demand curve for those exports. This can be simulated in the model through a rise in the world price of exports. Another A4T programme could be designed to improve the capacity to participate in trade negotiations, which if successful, could reduce the tariffs faced by Ethiopian exporters. This would also result in exporters receiving a higher price, which is how it is simulated in the model.

The next two A4T interventions proposed involve improving the productivity of factors, perhaps through supplying training and awareness of production processes (as in the leather industry example noted in Section 3). Such training could be focused on one factor or it could be a broader programme that would impact productivity of all factors. In the model, the possibilities that productivity has been augmented for skilled labour or for all factors have been simulated.

Capacity building could be focused on training for government officials to make them more efficient, such that they represent less of an impediment to exporters, and perhaps, other productive sectors. This would be a reduction in transaction costs to firms, which can be simulated by reducing trade margins.

¹⁵ Technical assistance and capacity building have been combined as they substantially overlap. To the extent that a distinction exists, technical assistance is “the transfer of skills,” whereas capacity building is a “more indigenous process,” (ICN, 2003) the latter typically taking longer.

The next category of A4T, *institutional reform*¹⁶, would likewise reduce transaction costs if the result were a more streamlined bureaucratic structure, which can be simulated by a reduction in trade margins.

The introduction of better quality assurance is an institutional reform that may enable Ethiopian products to be sold to new markets. In effect, this is similar to improving knowledge of foreign markets (above) in that the demand for exports expands, and this is modelled in the same fashion: raising the world price of exports.

The fourth category of A4T, *infrastructure improvements*, could be widespread throughout the economy, or may be focused on trade, such as upgrading the airport facilities. Either way, this can be simulated through a reduction in the appropriate margins.

Finally, *assistance with adjustment costs* essentially involves transfers to government, for example, to compensate for the loss of revenue from a tariff reduction. In the model, this would enter as an increase in transfers from the rest of the world to government i.e. an increase in aid. This last category has not been addressed separately in the simulations as all simulations include an increase in aid – assistance with adjustment costs may simply be one of the justifications for such an increase.

Based on these five A4T benefits, eight simulations are run, which are summarised in Table 5.2. The first simulation introduces an aid increase of 3 percent of GDP without any A4T benefits, i.e. considering only the demand side of an aid inflow. In the remaining seven simulations, it is proposed that within the 3 percent of GDP increase in aid, some A4T benefits are incorporated.¹⁷

The next five simulations introduce each of the five benefits in isolation, namely cutting margins for exporters, cutting margins for all production, increasing the productivity of skilled labour, increasing the productivity of all factors and increasing the world price of exports. The final two simulations are combinations of these five.

In the simulations involving a cut in margins, a 30 percent cut has been made, which seems a plausible reduction considering the weak initial state of physical and institutional infrastructure in Ethiopia.¹⁸ The cut focused solely on exporters could reflect improvements in the institutional arrangements for exporters, or a more efficient service for exporters at the sea port or airport. Increases in factor productivity were set at 10 percent, which could be achieved through training and updating of production processes. The rise in export price (simulating a shift in the

¹⁶ Institutional reform would likely be complemented by some technical assistance and capacity building.

¹⁷ In future, it would be interesting to simulate cost/benefit analysis of different types of A4T. Though, to date, no study directly evaluating the direct impact of trade assistance in the reduction of trade transaction costs has been published (Suwa-Eisenmann and Verdier, 2007:501-2), there are studies that can give useful indications of the orders of magnitude. The largely qualitative study by the OECD and WTO (2007a & 2007b), and another qualitative study by Duval (2006). There is also work by Brenton and von Uexkull (2006,2007), cited elsewhere, but as yet unpublished.

¹⁸ Note that these are comparative static simulations, which play out over a number of years. The increase of 3 percent of GDP would become a permanent increase in annual flow, whereas the 30 percent reduction in margins may take time to achieve. Dynamising the current model would allow the effects to be realised gradually, and this would be an interesting extension to the analysis.

demand for exports) could be achieved through better knowledge of foreign markets, new markets opening due to improved standards or better trade deals. A modest price increase of 5 percent has been simulated.¹⁹

Turning to the dynamic model, the same types of simulations have been introduced. The recursive dynamic model is now solving each year, so the changes must be introduced gradually. It is argued that for the changes to be introduced over eight years is a fair time period. All the simulations outlined above (the increase in aid, the cuts in margins, the rise in productivity and the rise in world prices) are introduced in eight equal stages. Therefore, the first simulation simply raises aid by 3% of GDP over eight years – exactly three eighths of one percent per year. After the first eight years (and the full introduction of the simulated change), the model continues to run for eight more years, meaning that the model runs from 2001 to 2017. During this time, any simulated change is maintained, with the only additional changes coming from the standard exogenous growth of a few elements (as outlined in section 4).

The other simulations are introduced in a similar fashion. The 30 percent cuts in trade and transport margins are introduced as 3.75 percent cut (of the initial value) per year for eight years; the model is then run forward for a further eight years with no further cuts being introduced (and the 30 percent cut maintained). The 10 percent rise in productivity is introduced as 1.25 percent rises for the first eight years. The 5 percent rise in world prices is introduced as 0.625 percent per year for the first eight years. Two combination scenarios are run, as in the static model, with multiple supply side effects being introduced gradually over eight years, with the model then being run for eight additional years (from 2001 to 2017).

6. Results

The static model results are summarised in Tables 6.1 to 6.5, with the dynamic model results in Tables 6.6 to 6.10 and Figures 6.1 to 6.8. This section firstly describes the impact of the simulations within the static framework, before moving on the dynamic model results.

6.1. Comparative Static Model Results

Starting with the main effects on the economy (Table 6.1), compared with the base run, one can see that the AIDONLY simulation shows the anticipated effects. The extra inflow of aid, without any compensating effects on the supply side, is sufficient to cause an 11 percent fall in exports (the largest of any of the simulations). This suggests that if aid delivers no benefits to exporters, it appears to be structurally damaging to the economy in that there is a shift away from exports, which tend to be high productivity activities. On the other hand, absorption rises, suggesting that the extra aid alone does deliver some welfare benefits, despite the fact that GDP at market prices rises by less than half a percent.

¹⁹ The magnitude of these effects is believed to be reasonable. Sensitivity analysis has been carried out, making the effects larger or smaller, and the same essential story holds.

All other simulations assume that at least some of the aid is channelled in such a way as to assist exporters (and often non-exporters also). These seven simulations are compared with the base run in Table 6.3, however, the focus of the paper is how these simulations compare with the introduction of aid without supply side effects (i.e. with the AIDONLY simulation). Therefore, in order to isolate the impact of the A4T elements, Table 6.2 shows each of the remaining seven simulations compared to the AIDONLY simulation.

The first thing to note from Table 6.2 is that all of the simulations do show an improvement in exports compared with the AIDONLY simulation, so to this extent, the interventions do qualify as A4T. Taking each scenario in turn, cutting export margins (AIDEXMARG) boosts exports by 5 percent, but has little additional impact on overall absorption.²⁰ As anticipated, the model shows further appreciation of the exchange rate as the economy shift resources even further towards the production of tradable goods. Cutting all margins (AIDALLMARG) does bring large overall benefits, with absorption rising by around 10 percent, which in turn helps to boost exports. Without the shift in production towards tradables (as occurred in AIDEXMARG), the scenario suggests a substantial depreciation of the real exchange rate, which also increases exports. This suggests that aid combined with improving infrastructure can raise overall welfare *and* have a positive structural impact on the economy.

If A4T includes an element for training skilled labour to make it more productive (AIDLABPRD), gains are widely seen across the board, however the export sector benefits disproportionately as it utilises a higher proportion of skilled labour. If however, A4T succeeds in promoting productivity across all factors (AIDPROD) substantial increases are shown across the economy, again with the export sector taking particular advantage (rising by around 18 percent).

The modest five percent increase in the world price of exports, simulated in AIDEXPRICE, does boost exports but not dramatically as elasticities are believed to be moderately low. As in AIDEXMARG above, further appreciate of the real exchange rate is observed.

The first of two combinations of these scenarios, AIDLABEX, includes a lowering of export margins, raising skilled labour productivity and the small rise in export price. Considering the elements of the change, the result is unsurprising: exports rise substantially despite further real appreciation, and the overall economy grows somewhat.

Lastly, AIDALL proposes that all the desirable A4T effects are achieved: margins are cut for all production, productivity rises for all factors and the export price rises. In this case, the economy would grow substantially with GDP at market prices up by around 24 percent. It is important to point out that the appreciation from AIDONLY is reversed into a depreciation further benefiting the export sector, which rises by around 39 percent.

²⁰ The small impact on absorption is understandable as export margin are small in the SAM: Birr 0.66 billion, compared with initial absorption of Birr 73.7 billion.

Turning the effects on the different productive sectors of the economy, shown in Table 6.3, one can begin to see the differential effects that the interventions have on each sector, depending on its characteristics. The increase in aid alone has varying effects on different sectors, which overall roughly balance each other such that the total value of output is almost unchanged. Taking a few activities as examples, the growing of oil seeds (aoils) experiences the largest percentage reduction in production (28 percent), which is driven by the fact that 54 percent of output is exported (and a further 24 percent is used as an input into the activity), therefore the sector is dramatically hit by the appreciation of the exchange rate. Some other sectors that experience large reductions in output, such as mining (aminig) and transport and communication (atrncom), also export much of their production.

A handful of large sectors experience large absolute increases in productivity (even if the percentage change is fairly modest). These include construction (acons), wholesale and retail (atrad), public administration (apadmin), and education and health (aeduhea). As these sectors produce nontradables, following the appreciation, they are relatively cheap to produce. Further changes are driven by changes to the relative price of intermediate inputs, skilled labour and capital.

Cutting trade and transport margins (AIDEXMARG and AIDALLMARG) is predictably more beneficial for those sectors that have higher margins to cut. Raising productivity of all factors (AIDPROD), raises production across the board, always at least matching any loss caused by the aid inflow. Raising only the productivity of skilled labour (AIDLABPROD) also benefits all sectors, though not always by quite the amount of the reduction caused by the aid inflow.

A small rise in the export price does help those industries that export, and a certain amount of substituting inputs away leaves a few sectors slightly worse off than under the aid inflow alone. The combination of a margin cut for exports, skilled labour productivity increase and a rise in the export price (AIDLABEX) is sufficient for almost every industry to raise production beyond the base scenario. Recall that this was the scenario under which the appreciation was the largest, which explains why nontradable sectors, such as wholesale and retail (atrad), are so successful.

The final combination scenario (AIDALL) shows widespread benefits across sectors with almost all producing more than the base. The largest absolute increase is in livestock and animal products (alivst), which increases by Birr 1.2 billion in value, and the total value of production rises by 12 percent.

The remaining two tables (6.4 and 6.5) show the differential effects by type of household and type of factor. Table 6.4 shows that the benefits from the simulations are shared between rural and urban households, though in all cases, urban households benefit more. This reflects the greater proportion of skilled workers in urban areas, whose wages rise, and the fact that urban households consume more tradable goods. Table 6.5 shows how the changes tend to harm the proportion of income going to unskilled labour, despite the fact that every scenario involves an increase in employment of this factor. (For example, in the AIDALL scenario, unskilled employment increases by 31 percent.) Note that the results here are driven by the closure rules chosen, namely that the wage of unskilled labour is fixed, whereas the

quantity of capital and skilled labour in fixed and their rental and wage rates are allowed to rise.

6.2. Dynamic Model Results

Beginning with the impact that the simulations have on exports, it can be seen from Figures 6.1 and 6.2 that aid alone does indeed harm exports and that all A4T benefits boost exports. Figure 6.1 shows all the value of exports in real terms over the sixteen year period. All simulations show growth in exports. The worst performing simulation with regard to exports, as expected, is AIDONLY, whilst the best is to have all A4T benefits, AIDALL. The same information is translated into the percentage deviation from the BASE run in Figure 6.2, which allows the relative performances to be seen more clearly. By 2017, the AIDALL simulation raises exports to 35% above the BASE, with significant improvements also made under the AIDPROD and AIDTRDMARG simulations. AIDTRDMARG (cutting margins for imports and exports) outperforms AIDALLMARG (cutting margins for imports, exports and domestic production), because it introduces a bias towards tradables. This is despite the latter being superior in terms of GDP, as will be seen below.

Figure 6.2 also clearly shows a break in the trends in 2009. Recall that the simulation impacts are gradually introduced in the eight years until 2009, with no further additional shocks in the second eight years.

The next two graphs (Figures 6.3 and 6.4) summarise the effects of the simulations on GDP at market prices. Growth is experienced under all scenarios, the BASE recording the weakest growth. Adding aid alone (AIDONLY) does increase GDP, however only by a very small margin above the BASE. Cutting export margins (AIDEXMARG) and a small rise in world prices (AIDEXPRICE) do little better, essentially because they are fairly small changes in magnitude relative to GDP.

Both the across-the-board margin cut (AIDALLMARG) and the rise in productivity of all factors (AIDPROD) both perform very well, raising GDP by between 12 and 13 percent above the BASE by 2009, and by 15 to 16 percent above the BASE by 2017. The largest rise is from AIDALL, which combines both of these A4T benefits with a small increase in the export price. AIDALL raises GDP by 26 percent above the BASE by 2009, and 34 percent by 2017.

As can be seen in Figures 6.5 and 6.6, a very similar story is told for absorption. One point to note is that the poorest performing simulations do result in larger improvements in terms of absorption than in terms of GDP. For example, though still the lowest performing simulation, AIDONLY raises absorption by 2.5 percent above the BASE by 2009, compared with raising GDP by only 0.7 percent.

These six figures (Figures 6.1 to 6.6) represent the key macro-economic results. The corresponding levels are reported in Table 6.6, together with reports for other macro-economic components. Three years are shown: the initial level (2001), the level after the simulated change has been fully implemented (2009) and the final level (2017). The corresponding growth rates for the same macroeconomic components are given in Table 6.7. For completeness, production activity tables have been included: levels of production (Table 6.8) and the growth of production over the whole period (Table 6.9).

It can be seen that though aid does boost production, total production is always larger when A4T benefits are incorporated (though rises and falls are observed at the individual product level).

The last tables and figures show which groups are benefiting from the changes. Table 6.10 and Figure 6.7 show the change in consumption by type of household (urban or rural). As expected, the overall rise in consumption reflects the rise in absorption, with AIDALL showing the largest rise overall. Both rural and urban households benefit to similar extents (in percentage terms), however in all cases rural households gain slightly more.

Table 6.11 and Figure 6.8 report the *average annual* growth in returns to factors. Overall, the results reflect macroeconomic benefits of each of the simulations, with AIDALL showing the most benefit, with AIDPROD and AIDALLMARG next. Interestingly, the greatest growth in return to capital is observed under the AIDPROD simulation. In all cases, skilled labour is expected to grow the most, slightly ahead of unskilled labour, and growth in returns to capital some way behind.

7. Conclusions and Recommendations for Future Research

The model presented here simulates an increased inflow of foreign aid that may include aid for trade (A4T) components. All five of the possible A4T benefits considered (cutting margins for exporters and generally across the economy, raising efficiency of skilled labour and for all factors, and a rise in the price of exports) did raise exports in the simulations, and at least partially offset any reduction in exports caused by an increase in the aid flow.

The analysis offers tentative policy prescriptions for donors and recipient governments. When aid policy is being designed, due consideration for the supply-side impacts can ensure that exports and other productive sectors are promoted. Counteracting the negative consequences of aid can be attempted such that aid not only provides more resources in the short term, but can also assist positive structural changes in the economy, and that exports can be encouraged to grow alongside a rising aid budget. The simulations suggest that reducing trade and transport margins for traded goods and raising overall productivity would both be particularly successful in boosting the level of exports for Ethiopia.

Extending to a dynamic model allows gradual rises in aid flows and gradual realisation of supply-side benefits. The broad conclusions are in line with the static model, strengthening the notion that if some aid is used to boost the productive economy, the negative impacts of aid can be ameliorated and positive impacts accentuated.

Regarding future research, it would be interesting to incorporate more precise information about the costs and benefits of A4T interventions (once it is available, perhaps through studies in progress cited above). This would not only allow more precise analysis within the current framework, but also comparisons could be made with other aid flows, and trade offs and complementarities could be analysed.

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Tables

Table 5.1: Types of A4T and how they might impact on the economy

A4T category ²¹	A4T intervention	Result (assuming success)	Enters into model as...
Technical assistance & capacity building	<i>improve knowledge of foreign markets</i>	<i>exogenous shift in the demand curve</i>	Raise price of exports
	<i>increase capability in trade negotiations</i>	<i>reduction in tariffs on export products</i>	Raise price of exports
	<i>improve productivity of skilled worker</i>	<i>boost the productivity of skilled labour</i>	Efficiency parameter for skilled labour
	<i>updating of production processes</i>	<i>boost the productivity of both labour and capital</i>	Efficiency parameter for all factors
	<i>streamline government bureaucracy</i>	<i>reduce transaction costs</i>	Reduce margins
Institutional reform	<i>institutional reform</i>	<i>reduce transaction costs</i>	Reduce margins
	<i>introducing quality assurance</i>	<i>exogenous shift in the demand curve</i>	Raise price of exports
Infrastructure	<i>improved infrastructure for importers and exporters</i>	<i>reduction in transport costs for exporters and importers only</i>	Reduce margins
	<i>improved infrastructure in general</i>	<i>reduction in transport costs in general</i>	Reduce margins
Assistance with adjustment costs	<i>temporary revenue replacement</i>	<i>an increase in the aid budget across the board</i>	Boost ROW transfers to GOV

Table 5.2: Simulations

Simulation	Description
1. Base	Base SAM data set for 2001/02
2. AIDONLY	Increase aid by 3% of GDP
3. AIDEXMARG	Increase aid by 3% of GDP, with 30% decrease in margins for exporters
4. AIDALLMARG	Increase aid by 3% of GDP, with 30% decrease in margins for all activities
5. AIDLABPRD	Increase aid by 3% of GDP, with 10% increase in skilled labour productivity
6. AIDPROD	Increase aid by 3% of GDP, with 10% increase in productivity of all factors
7. AIDEXPRICE	Increase aid by 3% of GDP, with 5% increase in price of exports
8. AIDLABEX	Increase aid by 3% of GDP, with above skld labour and exports effects (3, 5 and 7)
9. AIDALL	Increase aid by 3% of GDP, with all of above effects (scenarios 4, 6 and 7)

²¹ These categories relate to the five categories of A4T specified in World Bank & IMF (2005:3).

Table 6.1: Real changes to value of macro variables relative to the base
('base' column is the values in Birr 100s of millions, simulation columns are percentage changes on the base)

Variable	BASE Birr 100mn	AIDONLY %age chng	AIDEXMARG %age chng	AIDALLMARG %age chng	AIDLABPRD %age chng	AIDPROD %age chng	AIDEXPRICE %age chng	AIDLABEX %age chng	AIDALL %age chng
Exports	80.27	-11.10	-6.51	4.06	-5.62	5.14	-9.30	0.93	23.68
Real exchange rate ²²	1.00	-6.00	-8.66	6.66	-4.91	-2.67	-8.97	-10.65	6.44
Absorption	737.01	3.00	3.43	13.53	6.48	12.08	3.67	7.68	24.59
Private consumption	490.61	3.07	3.51	15.55	6.18	12.14	3.75	7.39	26.76
Fixed investment	142.47	3.15	3.79	12.20	6.03	12.21	3.99	7.61	23.45
Government consumption	103.93	2.44	2.60	5.82	8.49	11.62	2.84	9.18	15.89
Imports	177.09	5.81	7.89	12.68	8.30	13.17	8.68	13.55	24.38
GDP at market prices	640.19	0.45	0.95	12.58	4.46	10.91	0.65	5.21	24.54
Net indirect taxes	50.95	5.20	6.67	17.12	7.51	12.87	7.27	11.26	28.66
GDP at factor cost	589.24	0.11	0.15	1.24	4.23	10.75	0.18	4.35	12.12

Table 6.2: Real changes to value of macro variables relative to giving aid without any A4T benefits
('AIDONLY' column is the values in Birr 100s of millions, simulation columns are percentage changes on 'AIDONLY')

Variable	AIDONLY Birr 100mn	AIDEXMARG %age chng	AIDALLMARG %age chng	AIDLABPRD %age chng	AIDPROD %age chng	AIDEXPRICE %age chng	AIDLABEX %age chng	AIDALL %age chng
Exports	71.36	5.16	17.05	6.17	18.26	2.02	13.53	39.12
Real exchange rate ¹⁶	0.94	-2.82	13.47	1.16	3.55	-3.15	-4.94	13.24
Absorption	762.71	0.41	10.15	3.39	8.85	0.63	4.53	20.89
Private consumption	507.71	0.41	12.00	3.03	8.85	0.63	4.16	22.89
Fixed investment	147.44	0.61	8.77	2.79	8.78	0.81	4.32	19.68
Government consumption	107.56	0.16	3.30	5.91	8.96	0.40	6.59	13.13
Imports	187.38	1.97	6.49	2.35	6.95	2.71	7.32	17.55
GDP at market prices	646.69	0.49	11.97	4.00	10.44	0.19	4.72	23.87
Net indirect taxes	53.60	1.40	11.33	2.20	7.29	1.97	5.77	22.30
GDP at factor cost	602.51	0.05	1.08	4.12	10.61	0.08	4.25	11.92

²² Note: initial value set to one in the model; a negative change is an appreciation of Ethiopian currency.

Table 6.3: Real changes in value of output by productive activity

(Base column gives value in Birr 100s of millions; simulations give percentage deviation from the base)

Activity code	Description	BASE Birr 100mn	AIDONLY %age chng	AIDEXMARG %age chng	AIDALLMARG %age chng	AIDLABPRD %age chng	AIDPROD %age chng	AIDEXPRICE %age chng	AIDLABEX %age chng	AIDALL %age Chng
atef	Growing of Teff	5.84	0.88	0.60	7.50	7.28	11.93	1.53	7.71	20.22
abar	Growing of Barley	9.44	1.58	1.36	5.25	9.04	12.43	1.52	8.78	16.43
awhea	Growing of Wheat	11.47	-3.79	-6.26	-0.59	7.38	10.55	-6.45	1.72	10.51
amaiz	Growing of Maize	32.56	1.31	1.02	4.83	8.85	12.33	1.17	8.43	16.05
apul	Growing of Pulses	29.97	-0.65	-1.30	1.27	6.18	11.17	-0.76	5.31	12.86
avegfr	Growing of Vegetables and Fruits nec	39.15	0.08	0.06	0.41	0.70	10.25	0.07	0.67	10.59
aoils	Growing of oil seeds	4.10	-27.58	-30.75	-14.19	-4.16	0.04	-26.55	-9.23	16.04
acash	Growing of cash crops nec	14.04	-1.66	-0.50	8.07	3.26	9.81	-1.80	4.47	20.19
acrop	Growing of crops nec	2.73	-0.82	-1.73	5.07	5.44	10.68	-1.85	3.51	15.99
acoff	Growing of coffee	25.94	-0.41	-0.55	-0.29	0.16	9.98	-0.38	0.04	10.08
alivst	Livestock farming, animal products	73.79	0.95	1.21	5.57	4.89	11.58	0.97	5.24	16.79
amining	Mining and quarrying	4.34	-5.09	-0.35	4.98	-0.75	8.20	-4.64	4.42	18.77
ameatfv	Meat products	0.67	-3.28	6.59	48.84	2.93	9.08	-3.42	16.23	82.32
aofood	Manufacture of other food products nec	11.42	-0.69	0.05	11.06	3.80	10.05	-0.86	4.52	23.11
abev	Manufacture of beverages	6.37	0.93	0.83	4.63	4.63	10.64	0.94	4.55	14.78
atext	Manufacture of textiles	5.61	-2.75	3.80	15.93	2.03	8.99	-3.14	8.92	29.11
apaperp	Manufacture of paper products; printing	2.00	-4.28	-6.31	-2.89	2.98	8.60	-6.77	-1.82	6.87
aomanu	Manufacturing nec	8.93	-1.48	-2.03	12.27	2.75	9.40	-2.80	0.90	23.07
aelect	Electricity	15.58	0.26	0.28	1.05	1.46	10.27	0.25	1.49	11.15
acons	Construction	31.25	2.88	3.40	11.80	5.82	12.10	3.57	7.12	23.03
atrad	Wholesale and retail trade	72.94	1.15	1.88	-13.67	4.36	10.97	1.75	5.73	-4.60
atrncm	Transport and communication	36.46	-2.28	-3.34	-1.82	0.61	9.27	-2.38	-0.68	9.68
afserv	Financial intermediation	8.95	-2.37	-3.51	-3.45	1.12	9.06	-2.90	-0.65	7.02
apadmin	Public administration	40.70	1.38	1.15	4.74	7.98	11.10	2.00	8.41	15.50
aeduhea	Education, health and social work	26.80	2.32	2.36	4.79	8.63	11.53	2.58	9.03	14.61
aoserv	Other services nec	68.17	0.15	0.07	-0.78	2.16	10.50	0.27	2.19	9.62
Total		589.24	0.11	0.15	1.24	4.23	10.75	0.18	4.35	12.12

Table 6.4: Equivalent variation changes to consumption by type of household
(Base column gives value in Birr 100s of millions; simulations give percentage deviation from the base)

	BASE Birr 100mn	AIDONLY %age chng	AIDEXMARG %age chng	AIDALLMARG %age chng	AIDLABPRD %age chng	AIDPROD %age chng	AIDEXPRICE %age chng	AIDLABEX %age chng	AIDALL %age chng
Rural Households	171.29	1.83	2.56	11.47	5.36	11.36	2.73	7.09	23.21
Urban Households	319.32	3.68	3.91	16.12	6.54	12.55	4.19	7.36	26.96
Total	490.61	3.03	3.44	14.50	6.13	12.13	3.68	7.26	25.65

Table 6.5: Disaggregated factor income distribution, proportion of total income
(Base column gives percentage share of total income; simulations give percentage deviation from the base)

	BASE Birr 100mn	AIDONLY %age chng	AIDEXMARG %age chng	AIDALLMARG %age chng	AIDLABPRD %age chng	AIDPROD %age chng	AIDEXPRICE %age chng	AIDLABEX %age chng	AIDALL %age chng
Skilled Labour	40.37	0.09	0.13	1.36	-0.10	0.14	0.06	-0.08	1.41
Unskilled Labour	8.45	-0.06	-0.10	-0.07	-0.11	-0.23	-0.11	-0.21	-0.29
Capital	51.18	-0.02	-0.03	-1.29	0.21	0.08	0.06	0.29	-1.12
Total	100.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00

Table 6.6: Macro-economic components under simulations for three years: 2001, 2009, 2017 (100s of millions of Birr)

Macro-econ components	Year	1.BASE	2.AIDONLY	3.AIDEXMARG	4.AIDTRDMARG	5.AIDALLMARG	6.AIDLABPRD	7.AIDPROD	8.AIDEXPRICE	9.AIDLABEX	10.AIDALL
Exports	2001	80.2	80.2	80.2	80.2	80.2	80.2	80.2	80.2	80.2	80.2
	2009	141.0	131.7	134.7	153.2	147.3	139.2	153.7	134.7	145.3	174.9
	2017	246.3	237.3	241.6	280.2	273.3	253.0	282.0	241.7	261.3	332.1
Absorption	2001	737.0	737.0	737.0	737.0	737.0	737.0	737.0	737.0	737.0	737.0
	2009	1028.7	1054.1	1058.6	1133.6	1165.4	1093.1	1158.9	1064.1	1108.5	1297.0
	2017	1502.7	1537.7	1546.5	1690.2	1751.8	1608.3	1737.3	1560.8	1642.2	2021.5
GDP at MP	2001	640.2	640.2	640.2	640.2	640.2	640.2	640.2	640.2	640.2	640.2
	2009	931.9	938.1	942.6	1017.6	1049.4	977.1	1042.9	941.4	985.2	1172.3
	2017	1405.9	1421.7	1430.5	1574.2	1635.8	1492.2	1621.3	1432.7	1513.1	1888.8
GDP at FC	2001	589.2	589.2	589.2	589.2	589.2	589.2	589.2	589.2	589.2	589.2
	2009	718.4	721.5	721.9	729.3	732.0	724.2	730.0	722.8	726.0	742.8
	2017	905.3	914.3	915.9	945.4	956.0	925.5	948.8	919.9	933.0	1003.6
Investment	2001	142.5	142.5	142.5	142.5	142.5	142.5	142.5	142.5	142.5	142.5
	2009	191.6	197.4	198.4	214.9	221.0	203.5	216.4	200.4	207.6	246.5
	2017	270.6	277.6	279.2	308.8	319.2	289.2	313.0	283.5	297.0	370.1
Government Expenditure	2001	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9
	2009	146.3	149.1	149.1	155.9	156.5	157.7	163.6	149.9	158.6	172.7
	2017	210.6	214.7	214.9	227.3	229.4	227.9	239.6	216.5	230.4	258.4
Private Consumption	2001	490.6	490.6	490.6	490.6	490.6	490.6	490.6	490.6	490.6	490.6
	2009	690.9	707.6	711.1	762.8	788.0	731.9	778.9	713.9	742.4	877.8
	2017	1021.5	1045.5	1052.3	1154.1	1203.2	1091.1	1184.8	1060.8	1114.7	1393.0
Net Indirect Tax	2001	50.9	50.9	50.9	50.9	50.9	50.9	50.9	50.9	50.9	50.9
	2009	213.5	216.6	220.7	288.3	317.4	252.9	312.9	218.6	259.2	429.4
	2017	500.6	507.4	514.5	628.8	679.8	566.7	672.5	512.8	580.1	885.3
Imports	2001	-177.0	-177.0	-177.0	-177.0	-177.0	-177.0	-177.0	-177.0	-177.0	-177.0
	2009	-237.9	-247.7	-250.7	-269.2	-263.3	-255.2	-269.7	-257.4	-268.6	-299.6
	2017	-343.2	-353.4	-357.6	-396.2	-389.3	-369.0	-398.0	-369.8	-390.4	-464.7

Table 6.7: Macro-economic components under simulations, percentage growth from initial value (over whole period 2001-17)

Macro-econ components	1.BASE	2.AIDONLY	3.AIDEXMARG	4.AIDTRDMARG	5.AIDALLMARG	6.AIDLABPRD	7.AIDPROD	8.AIDEXPRICE	9.AIDLABEX	10.AIDALL
Exports	207%	196%	201%	249%	241%	215%	252%	201%	226%	314%
Absorption	104%	109%	110%	129%	138%	118%	136%	112%	123%	174%
GDP at MP	120%	122%	123%	146%	156%	133%	153%	124%	136%	195%
GDP at FC	54%	55%	55%	60%	62%	57%	61%	56%	58%	70%
Investment	90%	95%	96%	117%	124%	103%	120%	99%	108%	160%
Government	103%	107%	107%	119%	121%	119%	131%	108%	122%	149%
Private	108%	113%	114%	135%	145%	122%	142%	116%	127%	184%
Net Indirect	883%	897%	911%	1135%	1236%	1013%	1221%	907%	1040%	1639%
Imports	94%	100%	102%	124%	120%	108%	125%	109%	121%	163%

Table 6.8: Output of Production Activities under simulations for three years: 2001, 2009, 2017 (100s of millions of Birr)

		Simulation									
Activity	Data	1.BASE	2.AIDONLY	3.AIDEXMARG	4.AIDTRDMARG	5.AIDALLMARG	6.AIDLABPRD	7.AIDPROD	8.AIDEXPRICE	9.AIDLABEX	10.AIDALL
abar	2001	9.44	9.44	9.44	9.44	9.44	9.44	9.44	9.44	9.44	9.44
	2009	11.38	11.57	11.55	11.69	11.70	11.44	11.51	11.54	11.40	11.63
	2017	13.86	14.09	14.08	14.32	14.38	13.92	14.15	14.09	13.93	14.44
acash	2001	14.04	14.04	14.04	14.04	14.04	14.04	14.04	14.04	14.04	14.04
	2009	18.10	17.59	18.03	18.51	19.40	17.92	18.09	17.53	18.34	19.88
	2017	23.18	23.06	23.68	24.46	25.85	23.46	23.99	22.94	24.14	26.66
acoff	2001	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94	25.94
	2009	35.66	34.53	34.14	37.74	37.31	33.61	36.96	34.70	33.41	40.05
	2017	54.13	54.36	53.81	64.27	64.94	53.33	64.03	55.05	53.66	78.01
acons	2001	31.25	31.25	31.25	31.25	31.25	31.25	31.25	31.25	31.25	31.25
	2009	38.80	39.95	40.12	43.54	44.74	39.85	39.83	40.51	40.58	45.37
	2017	50.55	51.84	52.13	57.78	59.76	52.27	53.20	52.88	53.59	63.09
acrop	2001	2.73	2.73	2.73	2.73	2.73	2.73	2.73	2.73	2.73	2.73
	2009	3.21	3.23	3.23	3.31	3.42	3.18	3.25	3.19	3.15	3.41
	2017	3.81	3.86	3.87	4.02	4.19	3.81	3.95	3.83	3.80	4.24
aeduhea	2001	26.80	26.80	26.80	26.80	26.80	26.80	26.80	26.80	26.80	26.80
	2009	34.25	34.90	34.89	36.35	36.43	34.30	34.79	35.03	34.44	36.50
	2017	44.79	45.65	45.70	48.17	48.53	45.02	46.29	46.00	45.45	49.66
aelect	2001	15.58	15.58	15.58	15.58	15.58	15.58	15.58	15.58	15.58	15.58
	2009	19.43	19.79	19.92	20.51	21.24	20.20	19.92	19.82	20.37	21.44
	2017	25.35	25.90	26.15	27.51	28.81	26.74	26.85	26.09	27.20	30.18
afserv	2001	8.95	8.95	8.95	8.95	8.95	8.95	8.95	8.95	8.95	8.95
	2009	11.10	10.89	10.70	11.25	10.58	10.99	11.24	10.84	10.75	10.91
	2017	13.85	13.91	13.69	14.81	14.06	14.12	14.69	13.93	13.94	14.86
amaiz	2001	32.56	32.56	32.56	32.56	32.56	32.56	32.56	32.56	32.56	32.56
	2009	38.90	39.55	39.46	39.98	39.99	39.23	39.34	39.44	39.06	39.73
	2017	46.95	47.71	47.66	48.54	48.66	47.30	47.92	47.68	47.28	48.88

Table 6.8 (cont.): Output of Production Activities under simulations for three years: 2001, 2009, 2017 (100s of millions of Birr)

Activity	Data	1.BASE	2.AIDONLY	3.AIDEXMARG	4.AIDTRDMARG	5.AIDALLMARG	6.AIDLABPRD	7.AIDPROD	8.AIDEXPRICE	9.AIDLABEX	10.AIDALL
amfg1	2001	7.61	7.61	7.61	7.61	7.61	7.61	7.61	7.61	7.61	7.61
	2009	9.23	9.05	10.47	10.15	12.85	9.02	9.29	8.93	10.40	13.17
	2017	11.00	11.05	12.96	12.74	16.47	11.03	11.52	10.91	12.92	16.93
amfg2	2001	8.93	8.93	8.93	8.93	8.93	8.93	8.93	8.93	8.93	8.93
	2009	10.33	10.21	10.13	9.39	12.71	10.19	10.44	9.85	9.77	12.52
	2017	11.88	11.95	11.89	11.17	15.34	11.98	12.43	11.56	11.58	15.40
amining	2001	4.34	4.34	4.34	4.34	4.34	4.34	4.34	4.34	4.34	4.34
	2009	4.40	4.40	4.42	4.44	4.48	4.40	4.40	4.40	4.42	4.48
	2017	4.46	4.47	4.49	4.52	4.56	4.47	4.49	4.47	4.49	4.56
aoils	2001	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10
	2009	8.41	6.41	6.07	6.38	5.49	8.41	6.88	6.50	7.90	5.71
	2017	15.72	11.25	10.14	9.06	7.37	15.84	9.69	10.76	13.08	6.56
aoserv	2001	68.17	68.17	68.17	68.17	68.17	68.17	68.17	68.17	68.17	68.17
	2009	81.17	81.13	80.45	83.52	81.35	82.37	82.81	81.37	81.88	83.55
	2017	99.46	100.81	100.15	107.17	105.71	103.31	105.95	101.80	03.74	112.59
aothrag	2001	92.25	92.25	92.25	92.25	92.25	92.25	92.25	92.25	92.25	92.25
	2009	107.55	108.88	109.48	106.89	114.37	109.14	109.53	108.32	09.27	114.31
	2017	128.35	130.65	131.81	131.20	141.81	131.71	134.25	130.60	33.02	145.14
apadmin	2001	40.70	40.70	40.70	40.70	40.70	40.70	40.70	40.70	40.70	40.70
	2009	45.83	46.45	46.31	48.81	48.78	45.66	46.44	46.79	45.88	49.18
	2017	52.33	53.18	53.07	56.55	56.83	52.45	53.97	53.74	52.98	58.30
apul	2001	29.97	29.97	29.97	29.97	29.97	29.97	29.97	29.97	29.97	29.97
	2009	36.42	36.51	36.36	37.16	36.77	36.73	36.65	36.44	36.52	36.84
	2017	44.37	44.82	44.70	45.96	45.72	45.05	45.43	44.78	45.02	46.42

Table 6.8 (cont.): Output of Production Activities under simulations for three years: 2001, 2009, 2017 (100s of millions of Birr)

Activity	Data	1.BASE	2.AIDONLY	3.AIDEXMARG	4.AIDTRDMARG	5.AIDALLMARG	6.AIDLABPRD	7.AIDPROD	8.AIDEXPRICE	9.AIDLABEX	10.AIDALL
atef	2001	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84
	2009	6.80	6.87	6.86	7.24	7.25	6.75	6.88	6.93	6.81	7.32
	2017	8.04	8.16	8.17	8.72	8.79	8.03	8.30	8.26	8.15	9.03
atrad	2001	72.94	72.94	72.94	72.94	72.94	72.94	72.94	72.94	72.94	72.94
	2009	94.98	96.51	96.97	85.76	79.01	96.91	97.04	97.73	98.60	80.76
	2017	128.83	131.18	132.04	119.67	111.12	132.98	135.60	133.49	36.24	117.73
atrncom	2001	36.46	36.46	36.46	36.46	36.46	36.46	36.46	36.46	36.46	36.46
	2009	43.13	42.83	42.34	44.58	41.34	43.21	43.85	43.27	43.11	43.15
	2017	51.96	52.46	51.95	56.70	53.14	53.35	55.14	53.34	53.76	57.30
avegfr	2001	39.15	39.15	39.15	39.15	39.15	39.15	39.15	39.15	39.15	39.15
	2009	45.80	46.81	46.80	48.57	49.52	47.07	47.40	46.70	46.96	50.10
	2017	57.06	58.58	58.71	62.86	65.04	59.95	61.78	58.90	60.39	69.49
awhea	2001	11.47	11.47	11.47	11.47	11.47	11.47	11.47	11.47	11.47	11.47
	2009	13.54	13.43	13.21	13.51	13.27	13.63	13.46	12.97	12.97	12.82
	2017	15.33	15.36	15.12	15.23	14.93	15.41	15.23	14.77	14.66	14.09
Total	2001	589.24	589.24	589.24	589.24	589.24	589.24	589.24	589.24	589.24	589.24
	2009	718.42	721.49	721.89	729.28	732.01	724.20	729.99	722.80	725.97	742.84
	2017	905.26	914.28	915.95	945.43	956.00	925.51	948.83	919.86	933.01	1,003.57

Table 6.9: *Percentage Growth of Production Activities by Simulation over whole period, 2001-2017*

Activity	1.BASE	.AIDONLY	3.AIDEXMARG	4.AIDTRDMARG	5.AIDALLMARG	6.AIDLABPRD	7.AIDPROD	8.AIDEXPRICE	9.AIDLABEX	10.AIDALL
abar	46.8	49.1	49.1	51.7	52.3	47.3	49.8	49.1	47.5	52.9
acash	65.1	64.3	68.7	74.3	84.1	67.1	70.9	63.4	72.0	89.9
acoff	108.7	109.6	107.4	147.7	150.3	105.6	146.8	112.2	106.8	200.7
acons	61.8	65.9	66.8	84.9	91.2	67.3	70.2	69.2	71.5	101.9
acrop	39.6	41.5	41.8	47.2	53.6	39.4	44.6	40.4	39.1	55.2
aeduhea	67.1	70.3	70.5	79.7	81.1	68.0	72.7	71.6	69.6	85.3
aelect	62.7	66.3	67.8	76.6	84.9	71.6	72.3	67.4	74.6	93.7
afserv	54.6	55.3	52.8	65.4	57.0	57.7	64.1	55.6	55.7	66.0
amaiz	44.2	46.5	46.4	49.1	49.4	45.2	47.2	46.4	45.2	50.1
amfg1	44.6	45.2	70.3	67.4	116.4	44.9	51.4	43.4	69.8	122.5
amfg2	33.0	33.8	33.2	25.1	71.8	34.2	39.2	29.4	29.7	72.5
amining	2.8	2.9	3.4	4.0	5.1	3.0	3.3	3.0	3.4	5.1
aoils	283.3	174.4	147.2	120.9	79.6	286.4	136.2	162.4	218.9	60.0
aoserv	45.9	47.9	46.9	57.2	55.1	51.6	55.4	49.3	52.2	65.2
aothrag	39.1	41.6	42.9	42.2	53.7	42.8	45.5	41.6	44.2	57.3
apadmin	28.6	30.6	30.4	38.9	39.6	28.9	32.6	32.0	30.2	43.2
apul	48.0	49.5	49.1	53.3	52.5	50.3	51.6	49.4	50.2	54.9
atef	37.7	39.7	39.8	49.4	50.5	37.5	42.1	41.4	39.6	54.7
atrad	76.6	79.8	81.0	64.1	52.3	82.3	85.9	83.0	86.8	61.4
atrncm	42.5	43.9	42.5	55.5	45.7	46.3	51.2	46.3	47.5	57.2
avegfr	45.7	49.6	50.0	60.6	66.1	53.1	57.8	50.4	54.3	77.5
awhea	33.6	33.8	31.7	32.8	30.1	34.3	32.8	28.7	27.7	22.8
Total	53.6	55.2	55.4	60.4	62.2	57.1	61.0	56.1	58.3	70.3

Note: Factor employment of skilled labour and capital is fixed in mining.

Table 6.10: Change in Consumption (Equivalent Variation) (Initial gives values, other entries are deviations from initial at end of period in 2017)

	INITIAL	BASE	AIDONLY	AIDEXMARG	AIDTRDMARG	AIDALLMARG	AIDLABPRD	AIDPROD	AIDEXPRICE	AIDLABEX	AIDALL
Rural Households	171.3	112.0	116.8	118.1	136.4	145.0	127.1	145.5	119.5	131.4	182.1
Urban Households	319.3	104.2	109.1	110.6	131.6	141.7	118.0	136.4	112.5	123.2	179.3

Table 6.11: Annual percentage growth of returns to factors (average year-on-year growth, 2001-17)

	BASE	AIDONLY	AIDEXMARG	AIDTRDMARG	AIDALLMARG	AIDLABPRD	AIDPROD	AIDEXPRICE	AIDLABEX	AIDALL
Skilled labour	2.43	2.48	2.52	2.94	3.12	2.82	3.30	2.57	2.95	4.04
Unskilled labour	2.37	2.40	2.42	2.88	3.07	2.76	3.20	2.47	2.85	3.98
Capital	2.14	2.09	2.09	2.12	2.03	2.21	2.52	2.12	2.26	2.47

Figures

Figure 6.1: Value of exports under simulations (Birr 100s of millions)

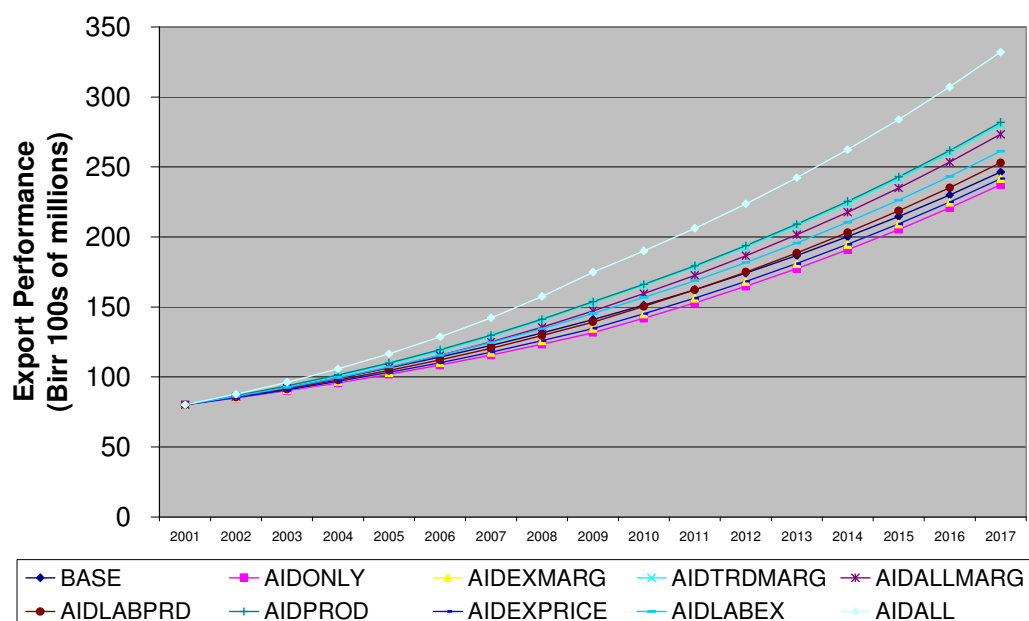


Figure 6.2: Value of exports under simulations (percentage change from Base values)

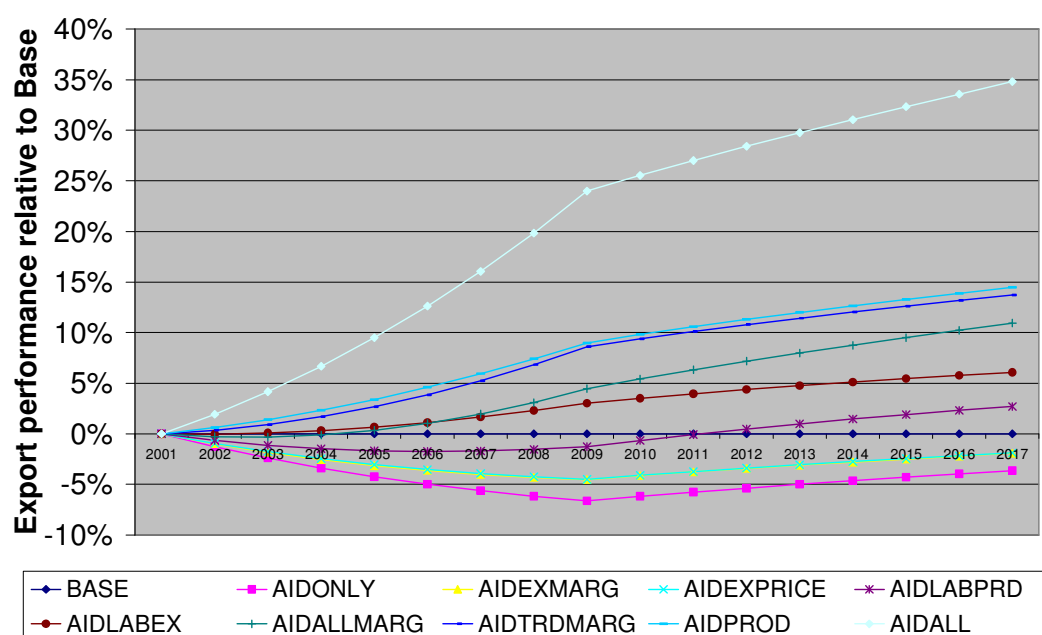


Figure 6.3: GDP at Market Prices under simulations (Birr 100s of millions)

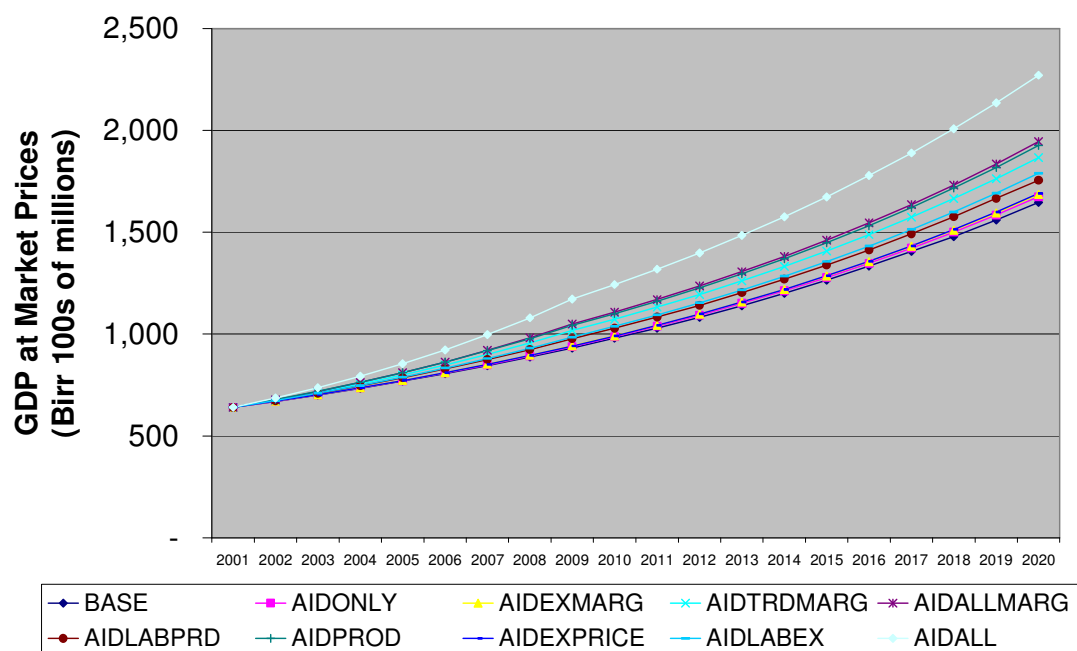


Figure 6.4: GDP at Market Prices under simulations (percentage change from Base values)

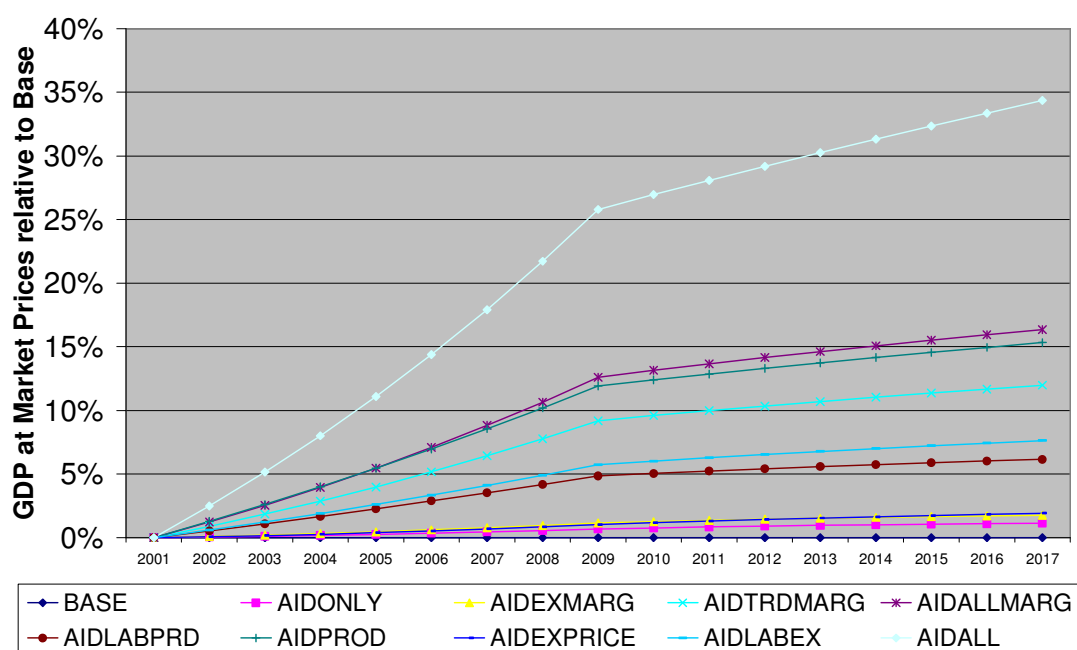


Figure 6.5: Absorption under simulations (Birr 100s of millions)

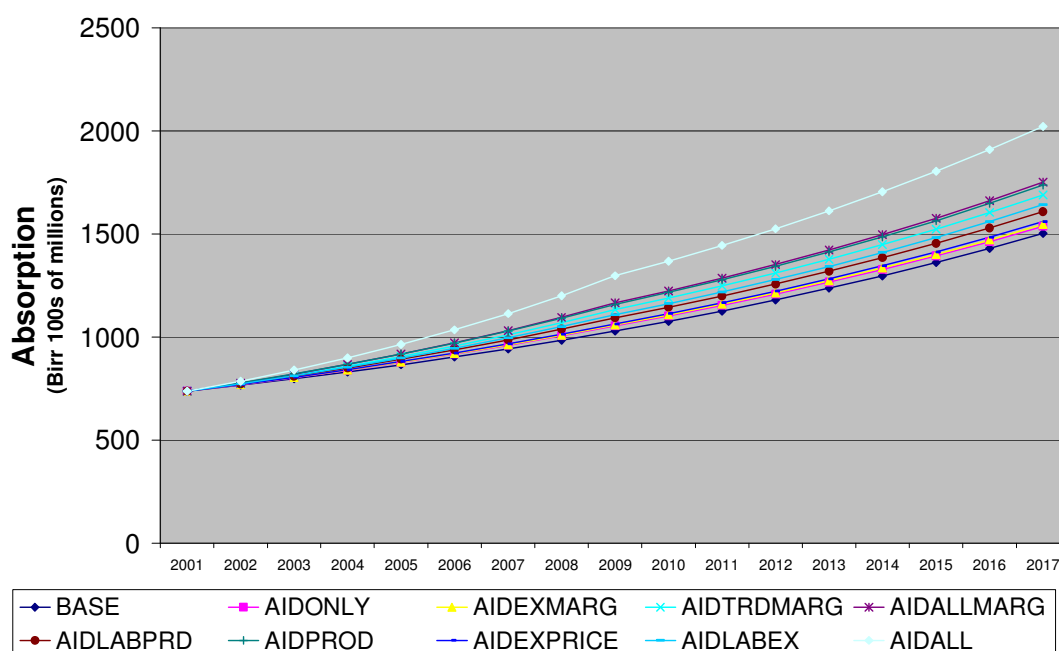


Figure 6.6: Absorption under simulations (percentage change from Base values)

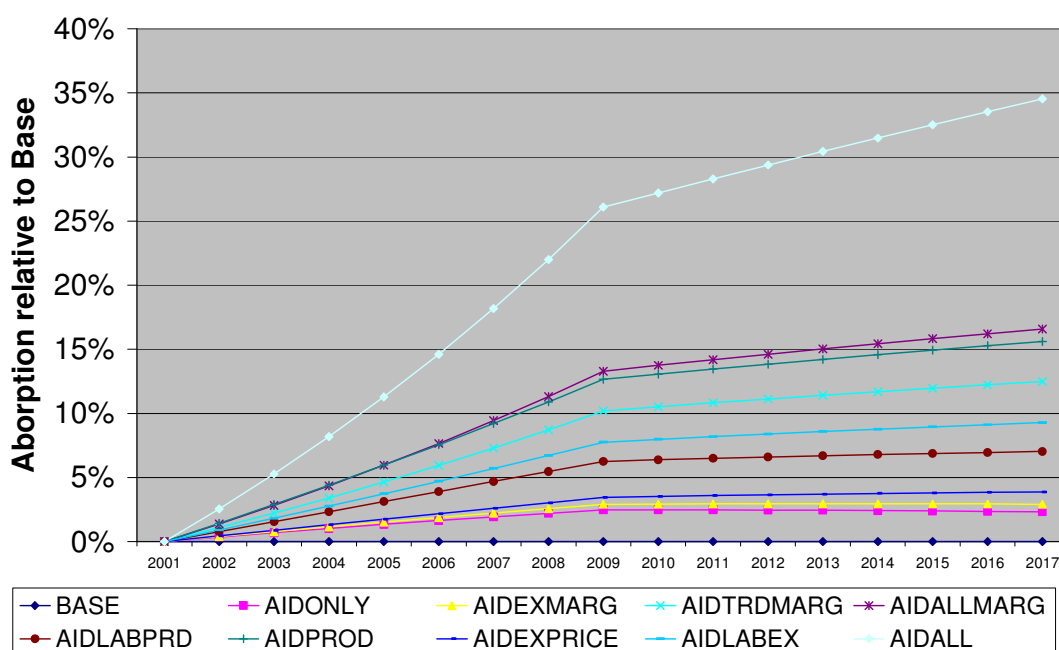


Figure 6.7: Change in Consumption (Equivalent variation) by Household Type

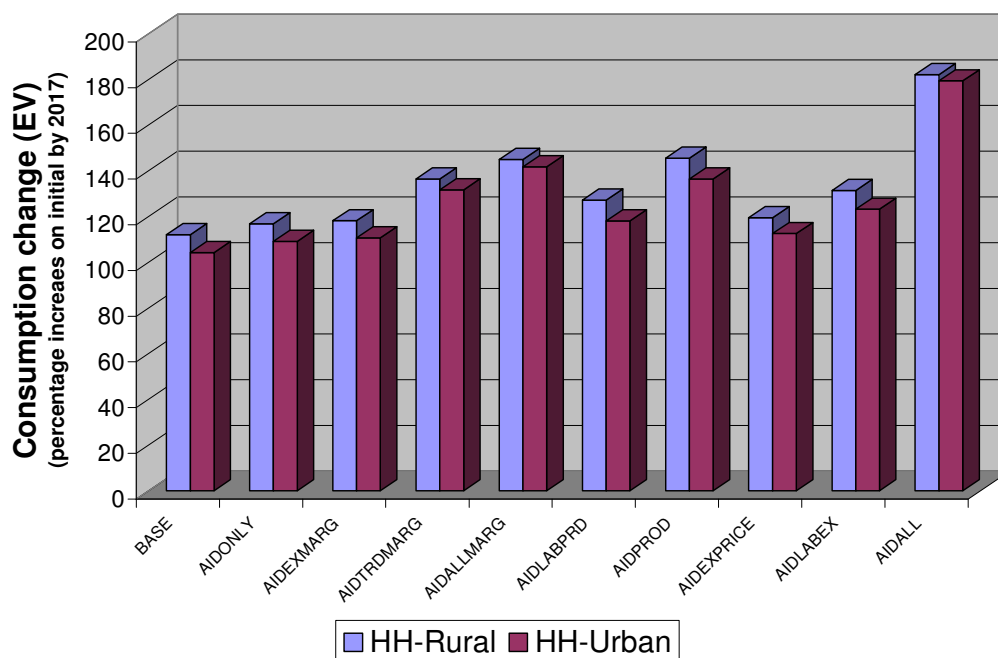
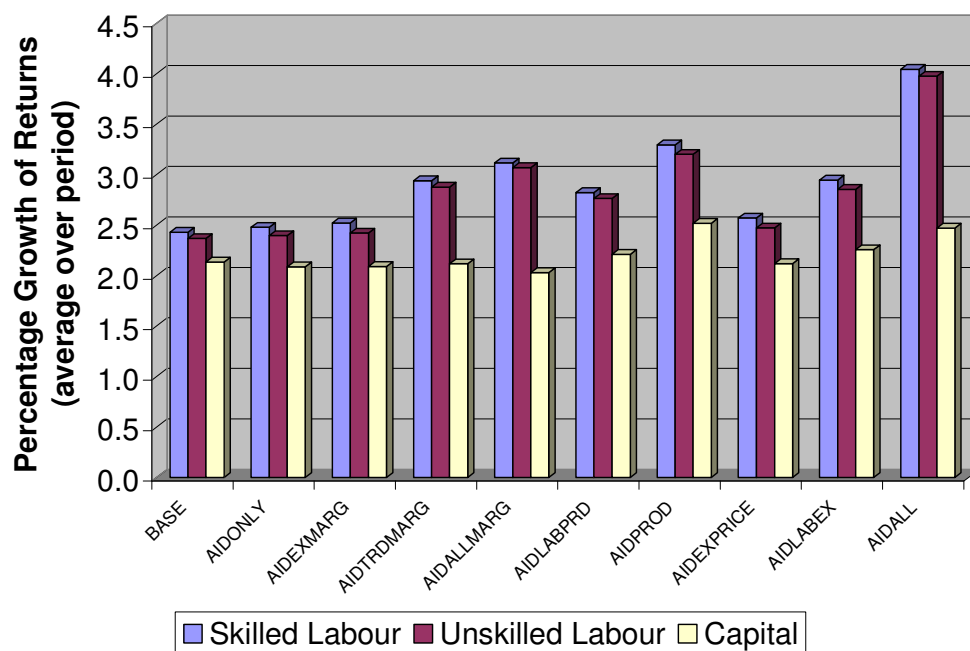


Figure 6.8: Average percentage growth of returns to factors (average year-on-year growth, 2001-17)



Appendix One: Ethiopia SAM Agents

Atef	Growing of Teff	csug	Sugar and sugar confectionary
Abar	Growing of Barley	cgmill	Grain mill products
awhea	Growing of Wheat	cfood	Food products nec; animal feeds
amaiz	Growing of Maize	cbev	Beverages
apul	Growing of Pulses	ctob	Tobacco Products
avegfr	Growing of Vegetables and Fruits nec	ctext	Textiles
aoils	Growing of oil seeds	capar	Wearing apparel
acash	Growing of cash crops nec	cleath	Leather products
acrop	Growing of crops nec	cwood	Wood products
acoff	Growing of coffee	cpaper	Paper products publishing
alivst	Livestock farming, dairy farming, production of animal products	coilptrl	Petroleum coal products
amining	Mining and quarrying	cfert	Fertilisers
ameatfv	Production, processing and preserving of meat and meat products	cchem	Chemicals, rubber and plastic products
aofood	Manufacture of other food products nec	cminprod	Mineral products nec
abev	Manufacture of beverages	cferr	Ferrous metals
atext	Manufacture of textiles	cmetal	Metals nec
apaperp	Manufacture of wood, paper and paper products; publishing; printing	cmprod	Metal products
aomanu	Manufacturing nec	cveh	Motor vehicles and parts; other transport equipment
aelect	Electricity	cmach	Machinery and equipment nec
acons	Construction	comanu	Manufactures nec
atrad	Wholesale and retail trade	celect	Electricity
atrncom	Transport and communication	cwater	Water
afserv	Financial intermediation	ccons	Construction
apadmin	Public administration	ctrad	Trade and repair services
aeduhea	Education, health and social work	chotel	Hotels and restaurants
aoserv	Other services nec	ctrans	Transport services
ctef	Teff	ccomm	Communication
cbar	Barley	cfserv	Financial services
cwhea	Wheat	cbserv	Business services nec
cmaiz	Maize	cpadmin	Public administration and defence
cpul	Pulses	ceduc	Education
cveg	Vegetables nec	cheal	Health
coils	Oil seeds	coserv	Recreation and other services
ccane	Sugar cane sugar beet	crest	Real estate and renting services
cfruit	Fruit Crops	Tradmrgm	Trade margins – imports
ctea	Tea	Transmrgm	Transport margin – imports
cchat	Chat	Tradmrgd	Trade margins – domestic goods
ccoff	Coffee	Transmrgd	Transport margin – domestic goods
ccrop	Cereal grains and other crops nec	Tradmrge	Trade margins – exports
cfibre	Plant-based fibers	Transmrge	Transport margin – exports
ccatt	Cattle	skldlab	Skilled workers
cpoul	Poultry; Other small livestock	unsklab	Unskilled workers
cmilk	Raw milk	Capital	Capital and Land
ccott	Raw cotton, Wool, silk-worm cocoons	Gov	Government
caprod	Animal products nec	HH-Rural	Rural households
cfors	Forestry	HH-Urban	Urban households
cfish	Fishing	ExpTx	Export taxes
ccoal	Coal	CmdtyTx	Commodity taxes
cngas	Gas	ImportTx	Import taxes
cmin	Minerals nec	InsttnTx	Direct taxes (on domestic institutions)
cmeat	Meat products	S-I	Savings and Investment
cvprod	Vegetable products; animal oils and fats	RoW	Rest of the world
cdairy	Dairy products	Total	Totals

Appendix Two: Sensitivity analysis

As there was limited Ethiopia-specific elasticities estimates, sensitivity analysis was carried out in the static model, dramatically changing the size of the elasticities, first increasing by fifty percent and then decreasing by fifty percent.

The overall message of the paper regarding the direction of impacts remains unchanged even after extreme changes in values. In particular, the overall impact on the economy is remarkably constant, as shown in Table 5.4, which includes just the impact on absorption and export levels under higher, actual and lower elasticities.

In all cases, absorption is somewhat higher when the economy is more flexible. Total exports display more variation: the more flexible the economy, the more able resources are to reallocate away from exporting in the AIDONLY scenario, and then typically, the more able resources are to return to exports, when A4T benefits are introduced. Whilst there is some variation in the magnitude (especially in the combination scenarios AIDLABEX and AIDALL), the story of the paper is not being driven by the elasticity estimates.

Table A2: Sensitivity analysis showing large changes in elasticities in static model

		BASE	AIDONLY	AIDEXMARG	AIDALLMARG	AIDLABPRD	AIDPROD	AIDEXPRICE	AIDLABEX	AIDALL
Elas*1.5	absrptn	737.01	3.02	3.53	14.15	6.59	12.38	3.74	7.95	25.86
Actual	absrptn	737.01	3.00	3.43	13.53	6.48	12.08	3.67	7.68	24.59
Elas*0.5	absrptn	737.01	2.97	3.36	13.12	6.31	11.79	3.61	7.40	23.61
Elas*1.5	exports	80.27	-11.75	-5.59	5.78	-5.89	5.35	-8.85	3.73	29.16
Actual	exports	80.27	-11.10	-6.51	4.06	-5.62	5.14	-9.30	0.93	23.68
Elas*0.5	exports	80.27	-9.20	-5.82	4.84	-4.48	5.60	-8.33	-0.23	21.14