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## The impact of a customs union with the EU on Turkey's welfare, employment and income distribution: An AGE analysis

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# Kiel Working Papers

Kiel Working Paper No. 843

**THE IMPACT OF A CUSTOMS UNION WITH THE EU  
ON TURKEY'S WELFARE, EMPLOYMENT AND  
INCOME DISTRIBUTION: AN AGE ANALYSIS**

by Roberto A. De Santis

December 1997



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by

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## ABSTRACT

The economic implications and the income distribution effects of the CU between Turkey and the EU have been studied by applying a general equilibrium model to the Turkish economy. The numerical results show that the CU is not trade diverting. Most importantly, urban (rural) groups are better (worse) off in the scenario with fixed wages, while urban (rural) groups are worse (better) off in the scenario with flexible wages. Despite the owners of basic skilled labour being better off than both the owners of skilled labour and the owners of capital, overall income inequality rises in the scenario with fixed wages, suggesting that analysis on income inequality based on the functional distribution of income and the full employment assumption (i.e. Stolper-Samuelson theorem), might be misleading. In addition, in the case of fixed real wages, the model predicts the creation of 148000 new jobs. Sensitivity analysis seems to support this overall conclusion.

**KEYWORDS:** Customs Union, Income distribution, Employment, AGE analysis, Turkey.

**JEL classification:** D58, F14, F15, F17.

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## 1. Introduction

In December 1995, the European Parliament ratified the customs union (CU) agreement with Turkey for mining and industrial products, with the exception of the commodities subject to the Common Agricultural Policy (CAP). This preferential trade arrangement came into force in January 1996. Despite this, very few attempts have been made to analyse the economic implications of this agreement on Turkey (Harrison, *et al.* 1997;<sup>1</sup> Mercenier and Yeldan, 1997<sup>2</sup>), and none of them has examined the impact on employment, and the distribution of income.

Trade and income distribution, and trade and employment have become two important issues among economists, as most of the recent studies argue that

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<sup>1</sup> By using a representative consumer AGE model, Harrison, *et al.* (1997) estimate that Turkey's welfare gain of the CU agreement with the EU is equal to 1.1% of 1990 Turkish GDP (2,861 Billions of 1990 Turkish lira). However, this result has been obtained under the assumption that the Turkish terms of trade for non-agricultural products with third countries rises by 4.2%. Harrison, *et al.* claim that, by the year 2001, Turkey will negotiate preferential trade agreements with third countries, with whom the EU has negotiated Association and Free Trade agreements. This assumption plays a key role in the estimate of the aggregate welfare gain. As Harrison, *et al.* (1997, pp. 866-867) put it: "Improved access to these markets results in a gain in Turkish welfare of 0.5%, which is the largest gain of all the components." However, the improved access has been extended to all non-member countries, whilst Turkish exports with the countries, which negotiated preferential access agreements with the EU, are less than one third of Turkish exports to all non-member states (United Nations, 1997).

<sup>2</sup> Mercenier and Yeldan (1997) use a representative agent multiregional intertemporal AGE model, with increasing returns to scale and imperfect competition, to show that the CU agreement with the EU is detrimental to Turkish welfare. They argue that this regional agreement would generate welfare gains to Turkish consumers if, and only if, full integration of the commodity market with nontariff barriers is achieved.

trade with poor countries is the main source of both the decline in employment (Katz and Murphy, 1992; Sachs and Shatz, 1994; Wood, 1994) and the increase in wage inequality (MacPherson and Stewart, 1990; Borjas, Freeman and Katz, 1991; Murphy and Welch, 1991; Borjas and Ramey, 1994; Wood, 1994; Sachs and Shatz, 1996) in industrialised regions.<sup>3</sup> The latter studies employ PE techniques to show that trade liberalisation widens the gap between the wage of the skilled worker (the abundant factor) and the wage of the unskilled worker (the scarce factor).<sup>4</sup> Similar results are obtained by McDougall and Tyers (1997), who use a multiregional AGE model to explore the impact of world trade “opening up” on factor price inequality within the developed countries. They also found that the wage-rental ratio declines in the developed countries, in accordance with the Stolper-Samuelson theorem, which states that with trade, aggregate welfare gains are accompanied by an income redistribution effect in favour of the factor which is intensively used in the production of the exportable good. However, it is

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<sup>3</sup> It must be stressed that other economists, such as Lawrence and Slaughter (1993), Krugman and Lawrence (1993) and Bound and Johnson (1992), argue that trade is not an important contributor of the increasingly unequal distribution of wages, and plays a minor role in the contraction of U.S. manufacturing output and employment registered in the eighties. They believe that technological change is the cause of these trends in U.S. economy. In contrast, Wood (1994) argues that technology is only a further plausible force to explain the rise in relative demand of skilled labour in developed countries, in particular in U.S.. In this study, technological change is not modelled.

<sup>4</sup> As MacPherson and Stewart (1990) pointed out, the immediate policy impact of this finding would be a request for trade protection by trade unions. The same concern is shared by Bhagwati and Dehejia (1994).



generally accepted that a trade policy satisfies the Pareto criterion of optimality, if those who gain from the policy *can* fully compensate those who lose.

Turkey is a middle income developing country abundant of both basic educated workers (basic skilled workers) and workers with virtually no schooling, who are unemployable in the manufacturing sector (no-skilled workers).<sup>5</sup> Since Turkey levies very high sectoral tariffs on goods imported from both the EU and the non member states, and since the European CAP is not part of the CU protocol, this preferential trading arrangement with the EU might favour a wage rise of the basic skilled workers relative to both the skilled workers, who are richer, and the no-skilled workers, who are poorer. As a result, the impact on inequality is ambiguous. In addition, the Stolper-Samuelson theorem enables one to determine the relationship which may exist between foreign trade and functional income distribution, but it cannot predict the effects on the size distribution of income, which depend upon the combined ownership structure of primary factors of production.<sup>6</sup> In a recent study on the theory of income distribution, Atkinson (1996, p. 20) says:

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<sup>5</sup> In this study, 8 labour categories are distinguished in 3 skilled workers and 5 unskilled workers. In turn, the latter group is distinguished in 4 basic skilled workers and 1 no-skilled workers. The no-skilled workers are farmers, who are unemployable in modern manufacturing. Migration issues are not taken into account.

<sup>6</sup> Adelman and Robinson (1989) provide a substantive discussion on these concepts.

“Statements about the distribution of national income between wages and profits, or about the relative wages of skilled and unskilled workers, do not tell us directly how the share of the top 20 per cent or the bottom 20 per cent is likely to have changed. The factor distribution is certainly part of the story, but it is only part, and the other links in the chain need to receive more attention.”

Nowadays, households receive their income from different sources, including capital, in the form of interest and dividends. In this study, each household income group engages its own members in eight different labour activities, owns two different shares of capital factor of production, and is a recipient of part of the quota rents which originate from the VER agreements with the EU.<sup>7</sup> As a result, the finding that trade widens (reduces) the wage gap between skilled and basic skilled workers in developed (developing) countries cannot be used to predict the impact on overall inequality. It seems that the issue of international trade and the size distribution of income has been neglected by trade theory

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<sup>7</sup> The European Commission and the Istanbul Textiles and Clothing Exporters Association (ITKIB) have agreed quantitative restrictions and price mechanisms for Turkish textiles in 1982 and for clothing categories in 1986. Since then, the VERs arrangements have been regularly renewed (GATT, 1994). The elimination of the VER on Turkish textiles and apparel exports is an important issue of the preferential trade arrangement agreed with the EU. The Turkish production of textiles and apparel comprises 13% of Turkey's industrial production, and their exports represent 38% of merchandise exports. Most of them are exported to the European market. Hence, the elimination of the VERs could have an important impact on the Turkish economy. Certainly, the quota rents on textiles and apparel accruing to the exporting firms, and transferred to households, would be annulled; although the output of these sectors would expand, affecting sectoral factor mobility, welfare and, as a consequence, the distribution of income. Also Harrison, *et al.* (1997) assume that Turkish exporters obtain improved access in textiles and apparel, which consists of an exogenous increase of the prices received by Turkish exporters to the EU on these goods. However, the quota rents are not annulled. Hence, they over-estimate the computed welfare gains.

mainly because it requires a general equilibrium framework where sectoral output, trade flows, prices, factor returns, factor inputs and households' income are all simultaneously determined. So I have built a single country AGE model which is able to trace such effects in a multi-sector, multi-labour, multi-household framework, to quantify in a GE setting the effects of the CU agreement with the EU upon the welfare of Turkish rural and urban households, and the functional and the size distribution of income in Turkey.<sup>8</sup>

As I have mentioned above, with regard to the issue of trade and employment, several studies show that the trade liberalisation process is the cause of the decline (increase) in manufacturing employment in industrialised (developing) countries (Wood, 1994). So it is important to examine what might be the impact of the CU agreement on Turkish employment. The technique employed follows Krugman's model of global trade, employment and wages (Krugman, 1995). Krugman uses a stylised numerical GE two-country model with two productive inputs, skilled labour and unskilled labour, and two goods, one exportable and one importable, to study the impact of trade on employment of an

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<sup>8</sup> The analysis of economic policies on income distribution with AGE models has a long tradition. Adelman and Robinson (1978) were pioneering in this regard, as they examined the impact of various policies affecting income distribution in Korea. Their model identifies 15 different categories of income recipients, classified according to their skills. However, the impact on the size distribution of income has been derived indirectly, by using the calculation on factor incomes and by assuming that the size distribution of income within each occupational group is represented by a lognormal distribution.

industrialised country in the case of rigid real wages. His model predicts a fairly large negative employment effect, in relation to the labour input used intensively in producing the importable good. Following Krugman (1995), the employment implications of the CU agreement on the Turkish economy have been examined under the assumption that real wages are constant. Since Turkish industries employ unskilled workers intensively in manufacturing exportable goods, the CU leads to a rise in Turkish employment, as one would expect from the Krugman model applied to a developing country. I estimate that the number of new jobs created is equal to almost 148000. As Turkish manufacturing industries expand, the demand of basic skilled production workers rises substantially, comprising 75% of the new jobs created.

The second important finding is that although the owners of basic skilled labour (the abundant factor) are better off than both the owners of skilled labour and the owners of capital (the scarce factors), the impact on inequality in Turkey is ambiguous: it increases in the scenario with fixed wages and declines in the scenario with flexible wages. This is due to the fall (rise) in both agricultural capital income and farmers' earnings in the scenario with fixed (flexible) wages, which brings about a substantial rise (decline) of inequality between urban and rural household groups. This suggests that the analysis of trade impact on the distribution of income, only carried out with models which define household

groups according to their functional role and under the full employment assumption, such as the Stolper-Samuelson model, might be misleading.

To measure the impact on welfare, I use the Hicksian equivalent variation, which is widely used in AGE literature. The results indicate that although Turkey's welfare gain is in aggregate equal to 1226-2750 billions of 1990 Turkish lira (470-1054 million US dollars), the welfare impact on most of individual households depends hugely on the assumption made for the labour market. In particular, several urban groups would suffer large welfare losses in the case of flexible wages.

The static single country AGE model for the Turkish economy presented in this study specifies 20 urban household groups and 19 rural household groups, disaggregated by income class groups. Factor inputs (8 different labour categories and 1 capital) are fully mobile among sectors. In addition, unlike the Krugman model where traded goods are homogenous, it is assumed that domestic products, imports and exports are imperfect substitutes, in order to capture the *cross-hauling* phenomenon. The model assumes perfect competition and constant returns to scale, and this is because the literature on trade liberalisation and income distribution, which I hope to contribute to, makes these assumptions. The intra-industry trade model used for this study adopts the consumption tax base definition of the VAT, as the effective VAT rates in Turkey are not uniform

among commodities. The multiregional relations have been described in the form of two trade flows, one with the EU and one with the Rest of the World (RoW). To measure inequality, the income received by household members, adjusted by the households' "true" cost of living index, has been employed as a unit of measure.

The study also consists of a further four sections. Section 2 defines the algebraic specification of the model, and the measures of welfare and income inequality. Section 3 describes the benchmark. Section 4 explores the effects of the policy simulations, and the final section provides some conclusions.

## **2. Model specification**

The trade model presented in this study is a standard static multi-sector, multi-labour, multi-household AGE model for Turkey with perfect competition and constant returns to scale. It is characterised by intra-industry trade as each tradeable commodity is exchanged in five different markets: the domestic market; the markets for imports from the EU, and the RoW; and the markets for export to the EU, and the RoW. This implies that although Turkey is assumed to be a price taker of international goods, domestic prices are endogenously determined. To

simplify the presentation, the specification of the model is divided into five components: production technology and factor demand, treatment of traded goods and foreign sector closure, household revenues and consumption, government revenues and consumption, and treatment of savings and investment decisions. In addition, the welfare and the income distribution measures have been reported. The complete algebraic formulation of the model is shown in Appendix A.

### *[2.1] Technology and factor demand*

The production technology is described by a three stage nested separable CES function. At the first stage, sectoral production is generated as a Leontief function between raw-material inputs, which are assumed to be strictly complementary, and the value added, which is, at the second stage, a CES combination of three factor inputs, such as composite skilled labour, composite unskilled labour and capital. At the final stage, composite skilled labour and composite unskilled labour are respectively a CES aggregation of different skilled occupational categories and of different unskilled occupational categories.

The demand for factor inputs is derived by solving a two stage dual problem. Firstly, the minimisation of the skilled (unskilled) labour cost function subject to the skilled (unskilled) labour aggregation function yields the demand of

labour for different skilled (unskilled) occupational categories. Secondly, the minimisation of the total cost function subject to the production technology yields the demand for composite skilled labour, for composite unskilled labour and for capital. In other words, producers behave competitively and the factor returns equal their marginal revenue product.

It is assumed that factor inputs are mobile between sectors. Total labour demand of each category is equal to exogenous labour supply of each category only when wages are flexible, whereas total capital demand always equates exogenous aggregate capital. In addition, since Turkish farmers are virtually without schooling, they are unemployable in manufacturing. Or to put it in another way, since 95% of employed persons in Turkish agriculture are self-employed or unpaid family labour (Bulutay, 1995), it is assumed that any effect of the trade policy is perceived on farmers' wages.

## *[2.2] Treatment of traded goods and foreign sector closure*

### *[2.2.1] Imports*

As far as the imports are concerned, on the supply side, the *small country* assumption is postulated with respect to both regions. Hence, the import supply



functions are represented by the import price equations for the EU ( $pm_j^{EU}$ ) and the RoW ( $pm_j^{RoW}$ ) commodities:

$$(1) \quad pm_j^{EU} = \overline{pwm}_j^{EU} (1 + tm_j^{EU}),$$

$$(2) \quad pm_j^{RoW} = \overline{pwm}_j^{RoW} (1 + tm_j^{RoW}),$$

where  $\overline{pwm}_j^{EU}$  and  $\overline{pwm}_j^{RoW}$  are the fixed world prices of similar imports produced by the EU and the RoW, respectively; and  $tm_j^{EU}$  and  $tm_j^{RoW}$  are the effective *ad valorem* regional import tariff rates, gross of the effective *ad valorem* Mass Housing Fund levies on EU and RoW commodities evaluated in terms of tariff equivalent.<sup>9</sup>

On the import demand side, a two stage nested separable CES function is employed. Thus, it is assumed that buyers first decide between domestically produced goods and the composite imported commodities, and then choose between imports from the EU ( $M_j^{EU}$ ) and imports from the RoW ( $M_j^{RoW}$ ) with elasticity of substitution  $\mu_j$ , according to the Armington specification (Armington, 1969), which states that products of different countries competing in the same market are imperfect substitutes:

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<sup>9</sup> Turkey has levied this surcharge on imports since 1984, the year of the Housing Fund law approved by the Turkish Parliament to finance the government's low cost housing scheme for poor and middle-class income households. The Mass Housing Fund duty will be phased out in 1998 (GATT, 1994).

$$(3) \quad M_j^{EU} = A_j^{\mu_j-1} \alpha_j^{\mu_j} \left( \frac{pm_j^{EU}}{pm_j^C} \right)^{-\mu_j} M_j^C,$$

$$(4) \quad M_j^{RoW} = A_j^{\mu_j-1} (1 - \alpha_j)^{\mu_j} \left( \frac{pm_j^{RoW}}{pm_j^C} \right)^{-\mu_j} M_j^C,$$

where  $M_j^C$  denotes the composite imports,  $pm_j^C$  is the composite domestic price of imports,  $A_j$  and  $\alpha_j$  are the shift and the share parameters of the CES import aggregation function.

### [2.2.2] Exports and VERs

With regard to exports, on the demand side, the *small country* assumption implies the export demand functions to both regions to be infinitely elastic. Hence, the Turkish export production is totally absorbed by foreign trade partners at world prices. However, for goods subject to VERs, the domestic supply price of exports ( $pe_i^{EU}$ ) is endogenously determined by the amount of output which is agreed to be exported. Hence,

$$(5) \quad pe_i^{EU} = \frac{\overline{pwe}_i^{EU}}{1 + qr_i^{EU}},$$

where  $\overline{pwe}_i^{EU}$  is the fixed price of exports prevailing in the EU market, and  $qr_i^{EU}$  represents the *ad valorem* export quota premium parameter on Turkish textiles and apparel. When  $qr_i^{EU}$  is zero, the domestic supply price of exports to the EU is equal to the price prevailing in the EU market.

On the supply side, the export supply functions to the EU ( $E_i^{EU}$ ) and the RoW ( $E_i^{RoW}$ ) are derived by maximising total export sale revenues subject to the export possibility frontier ( $E_i^C$ ), which is defined by a constant elasticity of transformation (CET) function. Hence,

$$(6) \quad E_i^{EU} = B_i^{-1} \left[ \beta_i + \beta_i^{\eta_i+1} (1 - \beta_i)^{-\eta_i} \left( \frac{pe_i^{EU}}{\overline{pwe}_i^{RoW}} \right)^{-(\eta_i+1)} \right]^{-\left(\frac{\eta_i}{\eta_i+1}\right)} E_i^C,$$

$$(7) \quad E_i^{RoW} = B_i^{-1} \left[ (1 - \beta_i) + \beta_i^{-\eta_i} (1 - \beta_i)^{\eta_i+1} \left( \frac{\overline{pwe}_i^{RoW}}{pe_i^{EU}} \right)^{-(\eta_i+1)} \right]^{-\left(\frac{\eta_i}{\eta_i+1}\right)} E_i^C,$$

where  $\overline{pwe}_i^{RoW}$  is the fixed price of exports prevailing in the RoW market,  $\eta_i$  the elasticity of transformation,  $B_i$  and  $\beta_i$  the shift and the share parameters of the CET export aggregation function. The composite export,  $E_i^C$ , is in turn derived by maximising total sales (domestic sales, plus export sales) subject to the production possibility frontier, which is a transformation function of the domestic good and the composite export with constant elasticity.

The rents from VERs ( $VER_i^{EU}$ ), which are allocated to the Turkish exporting sectors,<sup>10</sup> and then transferred to households, are proportional to the agreed quota premium and the level of exports:

$$(8) \quad VER_i^{EU} = qr_i^{EU} pe_i^{EU} E_i^{EU}.$$

When  $qr_i^{EU}$  is zero, quota rents disappear.

#### [4.2.2.3] Foreign sector closure

The current account deficit,  $\overline{CA}$ , is exogenously specified. Thus, the equilibrium in the balance of payments is:

$$(9) \quad \sum_i \overline{pwe}_i^{EU} E_i^{EU} + \sum_i \overline{pwe}_i^{RoW} E_i^{RoW} + \overline{CA} = \sum_j \overline{pwm}_j^{EU} M_j^{EU} + \sum_j \overline{pwm}_j^{RoW} M_j^{RoW}.$$

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<sup>10</sup> Since the Turkish government does not officially recognise any quota restriction, VERs agreements could only be made with Turkish industry associations (GATT, 1994). Thus, the rents from VERs accrued to the exporting firms which were able to obtain the export quota documents for deliveries to the EU.

[2.3] Households' revenues and consumption

[2.3.1] Households' revenues

The household sector comprises 20 urban and 19 rural household groups classified according to their income size. This disaggregation allows one to identify the losers and the gainers of the CU agreement between Turkey and the EU. The source of private income ( $HR_h$ ) originates from wage payments, returns to capital, plus rents from VERs:

$$(10) \quad HR_h = \sum_c \zeta_{hc}^L \sum_i w_c L_{ic} + \zeta_h^{agr} \sum_{agr} rAK_{agr} + \zeta_h^{nagr} \left( \sum_{nagr} rAK_{nagr} + \sum_i VER_i^{EU} \right),$$

where  $i = agr \cup nagr$ ,  $AK_{agr}$  and  $AK_{nagr}$  denote the net capital factor in agricultural and non-agricultural activities, respectively;  $L_{ic}$  represents the different labour categories employed in sector  $i$ ;  $r$  and  $w_c$  are the returns on capital and labours of different skills' categories, respectively;  $\zeta_{hc}^L$  represents the distributive share parameters of labour income to households; and  $\zeta_h^{agr}$  and  $\zeta_h^{nagr}$  represent the distributive share parameters of agricultural and non-agricultural capital incomes to households, respectively. Since the Turkish government did not take part in the VERs arrangements with the EU, the rents accrued directly to

the private companies, which then distributed them back to shareholders in the form of dividends, and therefore in proportion to  $\zeta_h^{nagr}$ .

### [2.3.2] Households' consumption

Since the model is static, the households' utility functions are defined only over composite commodities. The households' consumption behaviour is obtained by maximising their utility functions, subject to their disposable income after deduction of savings, which are simply measured by the product between the average propensity to save and households' disposable income. Because of lack of data on the values of the elasticity of substitution among commodities for each household group, consumers' preferences have been described simply by Cobb-Douglas utility functions.<sup>11</sup>

### [2.4] Government revenues and expenditure

The government levies various taxes in order to finance its expenditures: a direct tax on household income; duties on imported goods; and indirect taxes on goods

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<sup>11</sup> Harrison, *et al.* (1997) employs a CES utility function for their model with a representative consumer. The elasticity of substitution is also assumed *ad hoc*, and equal to 1.5.

and services. Despite the VAT system only being introduced in Turkey in 1985, VAT has become the main component of indirect tax revenues. AGE modellers usually levy the VAT rates on wage payments, plus the return to capital net of depreciation, thus assuming a proportionate tax on the value added by the firm (income tax base definition of the VAT).<sup>12</sup> However, by definition, VAT applies to commodities' sales net of all intermediate goods purchases (consumption tax base definition of the VAT). The consumption tax base definition of VAT is an equivalent concept of the income tax base definition only if the tax rate is uniform among commodities. However, the effective VAT rates in Turkey are commodity specific.<sup>13</sup> Hence, the consumption tax base definition of the indirect taxes has been employed as replacement tax to perform a revenue neutral tariff reform. A fuel consumption tax is also considered.

With regard to the apportionment of customs' revenues to Turkey, it is assumed that these revenues are distributed to the members of the EU in proportion to their imports from the RoW (Corden, 1984). Thus, the duties on RoW imports collected by Turkey continue to be considered revenues of the Turkish government after the CU agreement.

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<sup>12</sup>Harrison, *et al.* (1997) for example employ the VAT, defined on the income side, as a replacement tax to examine the impact of the CU agreement on Turkey's welfare.

<sup>13</sup>The VAT system has been introduced in Turkey in 1985. As has been reported by the OECD (1992, 1995), the tax administration is still inadequate in the face of a large underground economy. Hence, despite the general VAT rate being 12% in 1990, the effective VAT rate is not uniform among commodities.

Public expenditure is simply treated as exogenous transfers to households and foreign institutions, and exogenous consumption of public goods and services in real terms. Thus, the government is a separate consuming agent; however its consumption decisions are not affected by price changes.

#### *[2.5] Savings and investment decisions*

Since the purpose of the model is to measure the static effects of the preferential trade arrangements with the EU, savings and investment decisions have been treated in a simple fashion. Households' savings are a constant proportion of disposable income; foreign savings, given by the current account deficit, are set exogenously; the budget deficit is exogenously specified as a difference between public revenues and exogenous public expenditure; capital depreciation is also assumed to be exogenous. Aggregate savings always equates aggregate investment, set exogenously in the model. Investment spending in each sector is held constant in real terms.



## *[2.6] Welfare and inequality measures*

Two main indices are constructed to measure welfare changes in AGE literature: the equivalent variation and the compensating variation. Since they are very similar concepts, I use the Hicksian equivalent variation to study the impact of the partial trade liberalisation policy on each household income group. The welfare of urban and rural household income groups, and of the Turkish nation as a whole, is an additive aggregation of the welfare of each household income group.<sup>14</sup>

As far as the measurement of inequality is concerned, the study focuses on the inequality between urban and rural household members. The number of members within each household group varies substantially, and many of them are concentrated around the bottom and middle of the income distribution. This implies that considerable information would be lost if the income received by household income groups is used as a unit to measure inequality.<sup>15</sup> Since the data source does not provide any additional information concerning the income

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<sup>14</sup> Although this procedure is widely used in cost-benefit analysis, it presents problems related to interpersonal utility comparisons, which are described in Boadway (1974). However, if one accepts the Pareto criterion of optimality, the aggregation is admissible. A more general discussion can be found in Hammond (1991).

<sup>15</sup> Assume that there are two households groups (1 urban household group and 1 rural household group), each earning the same income. Obviously, income is equally distributed among household groups. Assume now that the rural household group is composed of  $k$  members. In this case, income would be unequally distributed among household members. This implies that the use of the income received by household groups as a unit of measure of inequality would be imprecise.

redistribution among household members in each income class group, the arithmetic mean income across household members in each income class group ( $hr_h$ ) has been employed to examine the CU impact on the size distribution of income. However, income does not capture directly the price effect as tariffs fall. Therefore, the ratio between  $hr_h$  and the “true” cost of living index,  $P_h = \prod_j (p_j / \vartheta_{jh})^{\vartheta_{jh}}$  where  $\vartheta_{jh}$  denotes the household budget share for good  $j$ , (that is, the indirect utility function) is used as a basis to measure inequality.<sup>16</sup>

A set of general entropy indices for discrete distributions ( $GE_\theta$ ) has been employed to measure inequality. Given the assumption that, within each income class group, members receive the same income,  $GE_\theta$  can be written as:

$$(11) \quad GE_\theta = \frac{1}{\theta^2 - \theta} \left[ \frac{1}{K} \sum_{h=1}^H \left( \frac{k_h hr_h / P_h}{hr^m} \right)^\theta - 1 \right], \quad K = \sum_{h=1}^H k_h,$$

where  $k_h$  represents the number of household members in each household income group  $h$ ;  $K$  the total number of members;  $hr^m$  the arithmetic mean income across household members for the entire population in real terms;  $H$  the number of households income groups, which is 39 (i.e. 20 urban and 19 rural household income groups); and  $\theta$  an arbitrary parameter which in principle can assume any

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<sup>16</sup> It must be stressed that household income does not adjust for differences in needs between households (so called *equivalisation* process), but only for the number of individuals (so called *reweighting* process). A fuller discussion on these issues can be found in Cowell (1984), Danziger and Taussig (1979), and Glewwe (1991).

real value, although particular values generate known inequality measures as specific cases. The generalised entropy index measures the average distance between each person's real actual income and the real income he would receive in a perfectly equal society. The advantage of this is that one can derive the inequality measure directly, without postulating the existence of a social welfare function, and discussing its desired properties (Cowell, 1995). The generalised entropy index has also been chosen as an indicator of income inequality because it has three main important properties: it satisfies the strong principle of transfer, according to which the change in inequality depends only on the "distance" between individual income shares, no matter which individuals one chooses; it is additively decomposable by population subgroups; and it encompasses all other measures that are ordinally equivalent: the entire subfamily of Atkinson indices ( $\theta < 1$ ), the Theil index ( $\theta = 1$ ) and half of the square of the coefficient of variation ( $\theta = 2$ ).<sup>17</sup> The additive decomposability property is very important for this study because one can compare the inter group income inequality among rural and urban areas and the inter group income inequalities among household members partitioned according to their geographical location.<sup>18</sup>

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<sup>17</sup> For proof and further discussion see Bourguignon (1979), Cowell (1980), Cowell and Kuga (1981a, 1981b), Shorrocks (1980).

<sup>18</sup> Appendix B describes the measurement of inequality in more detail.

### **3. Features and properties of the benchmark**

The benchmark for this study is mainly based upon the SAM for Turkey constructed for the year 1990 by the author in collaboration with Ozhan (De Santis and Ozhan, 1995 and 1997). The main feature of this SAM is that it incorporates information from household income and consumption expenditures survey as well as from household labour survey. However, this SAM does not provide information regarding regional trade data disaggregation. Thus, further sources have been used, such as a recent unpublished document of the State Institute of Statistics of Turkey (SIS), which shows the Turkish trade flows with the EU for the year 1990, and a recent unpublished dissertation by Kose (1995), who reports the import duties and the Mass Housing Fund duties, both disaggregated at regional level and consistent with the aggregate data published in the official Input-Output table for Turkey (SIS, 1994).

Table 1 shows a schematic representation of a SAM used for this study. Its main features are that firstly, the trade flows of Turkey are distinguished in two geographical directions: one with the EU and one with the RoW; and secondly, the rents on exports subject to the VERs are an income source of the factors of production accruing to the exporting firms. These aggregate accounts are disaggregated as follows: factor labour is disaggregated into 8 different types of

labour categories;<sup>19</sup> households are disaggregated according to their income size and to their geographical regions (20 rural and 19 urban households); activities and commodities are disaggregated into 20 different types and classified according to the I-O table classification.<sup>20</sup> The accounts for imports and exports are disaggregated to model the relations with the EU and the RoW.<sup>21</sup>

The 1990 SAM for Turkey defines the cost of labour in terms of wages and salaries in line with the official Input-Output table for Turkey. In other words, it includes only the cost of employees. This implies that sectors, such as agriculture, dominated by self-employed and unpaid family labour, would be characterised by an underestimated ratio between labour and capital.

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<sup>19</sup> Partly following Wood (1994), I classify professional workers, managerial workers and clerical workers as the skilled labour group, with post-basic education; sales workers, service workers, non-agricultural workers and other workers as the unskilled labour group, with basic education; and the agricultural workers as the no skilled labour group, with virtually no schooling.

<sup>20</sup> The disaggregated 1990 SAM for Turkey comprises 54 sectors. Since the formation of CU between Turkey and the EU involves only mining and manufacturing commodities, the author has mainly aggregated the sectors subject to the CAP, mining and services. Mining has been aggregated mainly because it is a very small sector in terms of share in the GDP, labour force employed and volume of trade.

<sup>21</sup> The EU is composed of 15 countries: 12 members existing in 1990, plus the new members Finland, Austria and Sweden.

**Table 1 Schematic representation of a SAM for Turkey 1990**

	<i>Factors</i>	<i>Households</i>	<i>Government</i>	<i>Activities</i>	<i>Cmp-Com</i>	<i>Imports EU</i>	<i>Imports RoW</i>	<i>Exports EU</i>	<i>Exports RoW</i>	<i>Cap-Acc</i>	<i>Foreign Institutions</i>	<i>Total</i>
<i>Factors (1)</i>				Gross Value Added				VERs Rents				<i>Gross Factor Income</i>
<i>Households (2)</i>	Factor Income											<i>Household Income</i>
<i>Government (3)</i>		Direct Taxes			Indirect Taxes	Import Duties	Import Duties					<i>Government Income</i>
<i>Activities (4)</i>					Domestic Sales			Exports	Exports			<i>Production Revenues</i>
<i>Cmp-Com (5)</i>		Consumption	Consumption	Intermediate Inputs						Investment		<i>Total Income</i>
<i>Imports EU (6)</i>					Gross Imports							<i>Supply of Imports</i>
<i>Imports RoW (7)</i>					Gross Imports							<i>Supply of Imports</i>
<i>Exports EU (8)</i>											Exports and rents	<i>Supply of Exports</i>
<i>Exports RoW (9)</i>											Exports	<i>Supply of Exports</i>
<i>Cap-Acc (10)</i>	Capital Depreciation	Savings	Budget Surplus								Current Acc. Deficit	<i>Aggregate Savings</i>
<i>Foreign Institutions (11)</i>						Net Imports	Net Imports					<i>Current Payments Abroad</i>
<i>Total</i>	<i>Gross Factor Payments</i>	<i>Households Expenditure</i>	<i>Government Expenditure</i>	<i>Production Costs</i>	<i>Total Absorption</i>	<i>Expenditure on Imports</i>	<i>Expenditure on Imports</i>	<i>Expenditure on Exports</i>	<i>Expenditure on Exports</i>	<i>Aggregate Investment</i>	<i>Net Foreign Exchange Receipts</i>	

**Table 2 Share of primary factor inputs in the value added (%)**

Sectors	Professional workers	Managerial workers	Clerical workers	Sales workers	Service workers	Agricultural workers	Production workers	Other workers	Capital
Agriculture		0,3	1,0	0,03	1,1	45,0	0,6		51,9
Mining	4,3	0,5	2,9		1,6		25,2		65,5
Food processed products	1,9	2,8	1,9	0,06	1,1		25,5	0,5	66,2
Beverages and tobacco	2,3	3,4	2,3	0,09	1,3		30,5	0,7	59,5
Textiles	1,3	2,0	1,4	0,05	0,8		17,8	0,4	76,3
Wearing apparel	1,5	2,2	1,5	0,04	0,8		19,6	0,4	73,9
Leather and fur products	0,4	0,5	0,4		0,2		4,5	0,1	94,0
Footwear	1,6	2,2	1,6		0,9		21,1	0,4	72,3
Wood and wood products	1,3	1,9	1,3	0,05	0,7		17,0	0,4	77,3
Chemical products	1,6	2,3	1,6	0,05	0,9		20,7	0,5	72,4
Petroleum and coal products	0,4	0,6	0,4		0,2		5,5	0,1	92,7
Non-metallic mineral products	1,7	2,5	1,7	0,05	1,0		22,7	0,5	69,8
Metal products	2,5	3,6	2,5	0,09	1,4		32,8	0,7	56,4
Machinery	1,6	2,3	1,6	0,06	0,9		21,2	0,5	71,8
Transport equipment	2,8	4,1	2,8	0,08	1,6		36,9	0,8	51,0
electricity gas	8,1	1,3	12,1	0,06	2,9		13,7	0,3	61,6
Construction	3,4	5,4	1,7		1,3		43,3	0,1	44,9
Trade, restaurants and hotels	1,8	0,3	3,1	6,90	9,8		2,4	0,1	75,7
Transport and communication	0,7	0,6	2,4	0,01	0,4		8,5	0,1	87,4
Other services	27,0	3,9	12,5	0,10	8,1		7,7	0,6	40,2
Average	16,7	4,8	11,3	3,60	10,6	22,3	30,0	0,7	63,0

Since self-employed and unpaid family labour comprise almost 95% of the employed persons in Turkish agriculture (Bulutay, 1995), and since this might effect the computation of the impact of the CU agreement on the size and the functional distribution of income, I have calculated the total farmers' earnings in Turkish agriculture for the year 1990, by using as a basis the average nominal wage in agriculture estimated by Bulutay for the year 1989 (Bulutay, 1995).<sup>22</sup> According to my estimates for agriculture, the ratio between farmers' earnings and value added is 45.01%, and the ratio between total labour cost and value added is 48.09%. In the SAM, these two ratios are respectively equal to 7.06% and 10.13% (see Table 2).

Table 3 shows the statistics related to Turkish production and cost structure.

Table 4 shows the official statistics related to the composition of demand and trade flows with the EU.

Tables 5 and 6 show the source of income of urban and rural households, disaggregated by their income size and split in twentieth percentiles. Each income class group contains a large number of household members.

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<sup>22</sup> I have also considered the fact that the index of prices received by farmers increased by 62.8% from 1989 to 1990 (SPO, 1996), and that the full time equivalent work in agriculture is 41% of the entire time, as it has been estimated for similar European countries, such as Greece (EC, 1996).



**Table 3: Production and cost structure in Turkey, 1990**

<i>Sectors</i>	$D_j$	$E_j$	$M_j$	$L_j$	$K_j$	$X_j$
				$D_j + E_j$	$D_j + E_j$	$D_j + M_j$
<i>Agriculture,</i>	93760	2513	3079	0.326	0.352	0.413
<i>Mining</i>	7005	510	11276	0.266	0.504	0.843
<i>Food processed products</i>	31663	4561	3264	0.073	0.142	0.358
<i>Beverages and tobacco</i>	8009	526	2068	0.223	0.328	0.110
<i>Textiles</i>	20798	6214	2414	0.071	0.240	0.547
<i>Wearing apparel</i>	5706	4814	587	0.062	0.225	0.028
<i>Leather and fur products</i>	1941	399	501	0.022	0.339	0.761
<i>Footwear</i>	1569	87	65	0.075	0.197	0.057
<i>Wood and wood products</i>	18060	295	1374	0.075	0.255	0.628
<i>Chemical products</i>	16658	1592	10524	0.100	0.262	0.599
<i>Petroleum and coal products</i>	16769	763	3652	0.021	0.263	0.895
<i>Non-metallic mineral products</i>	17117	1047	1960	0.127	0.294	0.761
<i>Metal products</i>	17221	3304	10313	0.096	0.124	0.907
<i>Machinery</i>	26146	1656	17850	0.107	0.272	0.285
<i>Transport equipment</i>	15660	939	9403	0.158	0.164	0.309
<i>Electricity, gas and waterworks</i>	11920	115	15	0.267	0.427	0.762
<i>Construction</i>	56015	0	0	0.229	0.187	0.000
<i>Trade, restaurants and hotels</i>	84208	8938	1220	0.175	0.544	0.320
<i>Transport and communication</i>	69366	12534	2205	0.079	0.548	0.396
<i>Other services</i>	76610	1255	662	0.500	0.336	0.325
<i>Total or Average</i>	596201	52062	82432	0.204	0.346	0.417

$D_j$ ,  $E_j$  and  $M_j$  are evaluated in billions of Turkish lira. So, in this Table, they indicate the volumes of domestic sales, exports and imports gross of tariffs, respectively.

In aggregate, the geographical subgroups are composed of about 25 million urban household members and almost 28 million rural household members. It is evident that much of the urban and rural population is concentrated in the bottom-middle of the income distribution.

**Table 4: Composition of demand in Turkey, 1990**

<i>Sectors</i>	$C_j$	$E_j$	$M_j$	$M_j^{EU}$	$E_j^{EU}$
	$D_j + M_j$	$D_j + E_j$	$D_j + M_j$	$M_j^{EU} + M_j^{RoW}$	$E_j^{EU} + E_j^{RoW}$
<i>Agriculture.</i>	0.553	0.026	0.032	0.265	0.464
<i>Mining</i>	0.063	0.068	0.603	0.016	0.871
<i>Food processed products</i>	0.596	0.126	0.093	0.465	0.534
<i>Beverages and tobacco</i>	0.856	0.062	0.204	0.069	0.032
<i>Textiles</i>	0.401	0.230	0.100	0.401	0.963
<i>Wearing apparel</i>	0.809	0.458	0.090	0.033	0.831
<i>Leather and fur products</i>	0.130	0.171	0.200	0.524	0.243
<i>Footwear</i>	0.709	0.053	0.038	0.369	0.287
<i>Wood and wood products</i>	0.338	0.016	0.069	0.641	0.193
<i>Chemical products</i>	0.398	0.087	0.385	0.644	0.434
<i>Petroleum and coal products</i>	0.228	0.044	0.135	0.240	0.700
<i>Non-metallic mineral products</i>	0.252	0.058	0.101	0.642	0.792
<i>Metal products</i>	0.000	0.161	0.369	0.312	0.330
<i>Machinery</i>	0.282	0.060	0.400	0.688	0.758
<i>Transport equipment</i>	0.317	0.057	0.369	0.598	0.321
<i>Electricity, gas and waterworks</i>	0.175	0.010	0.001	0.467	0.017
<i>Construction</i>	0.000	0.000	0.000	0.000	0.000
<i>Trade, restaurants and hotels</i>	0.573	0.096	0.014	0.486	0.440
<i>Transport and communication</i>	0.522	0.153	0.030	0.487	0.440
<i>Other services</i>	0.271	0.016	0.008	0.486	0.440
<i>Average</i>	0.375	0.080	0.118	0.447	0.556

Source: Data elaboration from SIS (1994) and from an unpublished document of SIS.

In fact, 87.7% of urban household members (almost 22 millions) and 91.2% of rural household members (almost 25 millions) earn an income level below the

47.4% of the population. This implies that intra group income inequality as well as inter group income inequality are important features of Turkey. It is also interesting to note, for the subsequent numerical analysis on income inequality, that the main income source of rural households is agricultural labour and capital incomes. A contraction (expansion) in agriculture would imply a fall (rise) in rural welfare and a rise (fall) in inter group income inequality.

Table 7 and 8 show the partition of consumption expenditures among households.

Table 9 shows the *ad valorem* effective indirect tax rates on goods and services, the *ad valorem* effective duties levied on foreign imports, the quota premium and the European common external tariff. It is evident that the sectors which are much more protected by an effective tariff are beverages and tobacco, wearing apparel, footwear, wood and wood products, petroleum and coal products, non metallic mineral products and transport equipment. One might expect that these sectors are those which would be much more affected by the CU with the EU. The *ad valorem* effective net indirect tax rates ( $t_j$ ) have been derived from De Santis and Ozhan (1995).

**Table 5 Household income in urban areas (in billions of 1990 TL and %)**

<i>Income groups</i>	<i>Household members</i>	<i>Professional workers</i>	<i>Managerial workers</i>	<i>Clerical workers</i>	<i>Sales workers</i>	<i>Service workers</i>	<i>Agricultural workers</i>	<i>Production workers</i>	<i>Other workers</i>	<i>Agricultural Capital</i>	<i>Non-Agricultural Capital</i>
Total income ( <i>Billions of TL</i> )		22,002	6,351	14,862	4,789	13,983	29,381	39,603	893	33,636	155,845
1st	191,797	0.18	-	0.63	0.44	1.58	0.20	2.15	1.12	0.00	0.03
2nd	2,084,093	1.68	0.06	10.66	1.96	8.00	0.50	7.89	3.70	0.12	0.54
3rd	3,929,142	7.99	0.58	13.62	2.55	11.99	0.61	10.16	9.63	0.31	1.42
4th	3,844,072	6.90	1.15	10.54	3.72	9.68	0.65	9.76	13.44	0.40	2.38
5th	3,065,584	6.10	1.73	7.69	4.57	5.56	0.65	7.43	7.84	0.50	3.27
6th	2,368,164	5.54	2.24	6.04	3.90	3.50	0.54	5.67	10.75	0.49	3.34
7th	2,013,527	4.78	2.47	6.16	4.36	3.16	0.48	4.74	11.53	0.53	4.11
8th	1,324,046	4.16	2.52	4.04	3.51	2.54	0.48	3.38	8.96	0.41	3.78
9th	1,137,946	3.57	2.47	3.42	4.61	1.58	0.33	2.68	5.94	0.42	3.60
10th	795,868	3.65	2.31	2.17	3.34	1.20	0.17	2.01	5.60	0.17	2.78
11th	1,196,026	5.99	7.54	3.48	6.26	2.35	0.54	2.51	5.94	0.42	6.29
12th	837,296	5.04	5.09	2.11	4.76	2.40	0.50	1.90	1.90	0.64	5.35
13th	601,592	4.66	5.50	1.31	3.99	2.30	0.41	1.14	-	0.49	4.27
14th	373,861	4.45	4.61	0.11	3.28	0.82	0.39	1.22	-	0.23	3.43
15th	249,915	3.39	2.03	0.74	2.34	1.49	0.07	0.55	1.90	0.14	2.50
16th	598,479	7.90	11.48	1.71	6.37	1.39	0.69	2.07	-	0.81	8.07
17th	193,393	2.80	5.78	-	3.34	0.53	0.15	0.64	-	0.31	4.11
18th	185,608	5.66	13.89	-	5.18	1.92	0.15	0.73	-	0.39	9.00
19th	30,698	-	11.45	-	1.23	-	0.20	0.41	-	0.19	3.12
20th	10,733	-	2.00	-	0.75	-	-	-	-	-	1.95
<i>Total</i>	<i>25,031,840</i>	<i>84.43</i>	<i>84.90</i>	<i>74.42</i>	<i>70.47</i>	<i>61.98</i>	<i>7.70</i>	<i>67.05</i>	<i>88.24</i>	<i>6.98</i>	<i>73.32</i>

**Table 6 Household income in rural areas (in billions of 1990 TL and %)**

<i>Income groups</i>	<i>Household members</i>	<i>Professional workers</i>	<i>Managerial workers</i>	<i>Clerical workers</i>	<i>Sales workers</i>	<i>Service workers</i>	<i>Agricultural workers</i>	<i>Production workers</i>	<i>Other workers</i>	<i>Agricultural Capital</i>	<i>Non-Agricultural Capital</i>
Total income ( <i>Billions of TL</i> )		22.002	6.351	14.862	4.789	13.983	29.381	39.603	893	33.636	155.845
1st	891,853	0.30	0.03	0.28	0.29	1.44	1.78	1.60	0.34	0.53	0.07
2nd	2,927,443	1.45	0.09	3.42	0.63	6.38	5.42	4.39	1.12	2.90	0.56
3rd	4,289,044	2.83	0.88	4.39	1.90	7.09	7.09	5.70	0.34	5.01	1.70
4th	4,195,913	2.89	0.88	6.16	2.63	5.85	8.71	4.69	-	7.69	2.03
5th	3,444,371	2.33	0.94	3.42	3.38	6.52	8.45	3.28	3.70	8.48	2.27
6th	2,469,112	1.03	0.71	3.88	1.59	3.98	7.07	3.26	1.46	8.26	1.75
7th	1,950,201	0.85	1.43	1.14	1.27	1.29	6.72	3.21	-	8.00	1.48
8th	1,508,911	0.47	0.71	1.25	1.00	0.62	7.54	1.36	-	6.93	1.77
9th	1,306,443	0.30	0.94	0.40	2.09	0.34	6.61	1.51	-	6.78	1.45
10th	867,520	0.15	0.27	1.08	0.96	0.29	2.69	0.67	-	5.04	0.68
11th	1,512,805	0.20	1.09	0.17	1.34	1.54	9.45	1.43	1.12	11.00	2.01
12th	764,382	0.26	0.79	-	1.84	1.82	5.72	0.52	3.70	6.25	1.43
13th	448,989	0.30	0.27	-	2.23	0.62	2.51	0.29	-	2.75	1.35
14th	358,242	0.71	1.70	-	2.21	-	0.87	0.46	-	2.58	1.92
15th	216,019	0.35	0.50	-	1.55	-	1.08	0.32	-	1.55	0.85
16th	338,024	1.15	0.91	-	2.28	0.24	1.89	0.28	-	2.74	2.09
17th	175,218	-	2.20	-	1.42	-	3.69	-	-	4.18	1.28
18th	150,188	-	0.74	-	0.92	-	4.29	-	-	2.32	1.53
19th	7,380	-	-	-	-	-	0.72	-	-	0.05	0.47
20th	-	-	-	-	-	-	-	-	-	-	-
<i>Total</i>	<i>27,822,058</i>	<i>15.57</i>	<i>15.10</i>	<i>25.58</i>	<i>29.53</i>	<i>38.02</i>	<i>92.30</i>	<i>32.95</i>	<i>11.76</i>	<i>93.02</i>	<i>26.68</i>

**Table 7 Expenditures of urban households (in billions of 1990 TL and %)**

Household groups	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	16th	17th	18th	19th	20th
Total expenditures	1747	9101	13593	13541	11877	10432	10476	8699	7477	6182	12548	10109	7321	6342	4285	13218	5569	13542	2570	1288
Agriculture	27.5	22.8	23.5	22.0	20.7	19.2	18.5	17.9	16.4	16.0	14.6	14.5	14.2	10.9	12.3	10.8	9.1	6.7	13.2	4.7
Mining	0.3	0.4	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.7	0.6	0.8	0.6	0.5	0.5	0.4	0.4	0.4	0.3
Food processed products	14.8	10.7	10.8	8.8	8.9	8.3	7.8	7.4	6.6	6.5	5.8	5.6	5.4	4.4	5.0	4.2	3.5	2.3	4.2	2.3
Beverages and tobacco	3.6	7.8	3.6	3.4	3.6	3.2	3.2	3.1	3.0	3.3	2.8	2.5	3.0	2.5	3.0	2.4	3.4	2.4	2.8	4.8
Textiles	3.0	4.7	4.6	4.7	4.3	3.9	4.2	3.3	2.8	3.0	3.0	2.5	3.0	2.0	2.2	2.3	1.6	0.7	5.3	1.9
Wearing apparel	1.1	1.3	1.6	1.9	1.9	2.0	2.1	2.2	2.1	2.1	2.0	2.1	2.1	2.7	2.3	2.6	2.5	1.9	3.6	2.6
Leather and fur products	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.2	0.2
Footwear	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.5	0.6	0.6	0.4	0.8	0.5
Wood and wood products	1.2	1.6	2.5	2.5	2.9	3.0	2.6	2.7	2.5	2.4	2.9	2.5	2.2	4.7	3.9	2.6	3.8	3.0	2.7	0.9
Chemical products	5.9	4.1	4.4	4.5	4.1	4.1	4.2	4.3	4.1	4.1	4.1	5.0	4.3	4.2	4.0	4.5	5.4	4.2	5.1	2.3
Petroleum and coal products	1.1	0.7	1.1	1.6	1.7	2.1	2.9	3.7	3.5	3.8	4.8	4.7	6.5	5.5	5.1	5.3	4.5	3.8	4.7	1.6
Non-metallic mineral products	0.9	1.7	1.5	2.0	2.3	2.1	1.9	2.1	1.7	1.6	2.1	2.4	1.7	1.7	1.7	1.5	2.4	1.5	1.2	2.9
Metal products																				
Machinery	2.9	4.2	4.5	4.6	4.0	4.4	4.6	4.3	5.8	4.9	4.7	5.8	5.2	6.2	4.6	5.9	7.5	6.8	3.7	8.7
Transport equipment	0.3	3.2	2.1	1.9	1.4	1.9	1.6	1.1	3.1	3.6	2.9	3.6	2.4	1.4	3.2	5.0	4.2	14.0	0.6	11.6
Electricity gas	1.7	1.2	1.3	1.2	1.2	1.1	1.1	1.0	1.0	1.0	1.0	0.7	1.0	0.9	1.1	0.8	0.7	0.7	0.5	0.5
Construction																				
Trade, restaurants and hotels	14.0	14.2	15.5	16.2	17.3	18.1	18.1	18.9	19.6	19.2	20.7	19.9	20.4	22.0	23.7	23.1	23.1	28.1	26.2	37.7
Transport and communication	11.7	13.2	13.5	15.2	15.7	16.5	16.5	16.1	16.3	17.1	16.6	15.8	15.6	16.6	12.9	16.1	14.7	12.5	13.3	7.3
Other services	9.6	7.8	8.5	8.5	8.8	8.9	9.5	10.7	10.3	10.3	10.8	11.2	11.7	12.9	13.9	11.6	12.5	10.4	11.6	9.5

Source: De Santis and Ozhan (1995)

**Table 8 Expenditures of rural households (in billions of 1990 TL and %)**

Household groups	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	16th	17th	18th	19th
Total expenditures	2773	7066	10477	10998	10476	7906	6402	5476	4331	2770	6428	4029	2595	2412	1324	2835	2004	1738	248
Agriculture	35,6	32,7	29	28,7	28	28,7	27,3	28,3	28	25,4	27,1	26,9	22,2	22,5	23,1	26,8	27,5	23,8	18,1
Mining	0,2	0,3	0,2	0,4	0,3	0,3	0,3	0,2	0,3	0,2	0,3	0,2	0,3	0,2	0,5	0,4	0,2	0,2	0,4
Food processed products	11,4	11,2	9,9	10,5	9,7	10,3	9,3	10,5	11,3	9,6	10,4	11,3	9,1	9,1	10,1	10,1	9,5	8,3	8,9
Beverages and tobacco	4,5	3,4	4,2	3,7	3,2	3,7	3,1	3,3	2,7	2,6	2,7	2,9	3,4	3,7	4,2	1,6	1,8	4	2,4
Textiles	3,2	3,9	4,2	4,1	4,7	4,9	5,4	5,1	4,8	4,8	4,2	4,2	2,8	3,8	3,6	4,4	4,7	7,4	11,7
Wearing apparel	0,9	1,5	1,8	1,6	2,4	2,2	1,7	1,8	2,2	2,4	2,1	2,1	1,8	1,6	2,4	2,5	1,7	2,9	2,8
Leather and fur products	0,07	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,08	0,2	0,1	0,1	0,2	
Footwear	0,2	0,3	0,4	0,4	0,5	0,5	0,4	0,4	0,5	0,5	0,5	0,5	0,4	0,4	0,5	0,6	0,4	0,6	0,8
Wood and wood products	0,8	1,6	1,9	2,4	2,7	2,3	3,5	2,4	3	2,9	1,1	3,4	3,5	4,1	3,2	1,1	1,1	1,3	0,4
Chemical products	4,4	4,4	3,7	3,8	3,7	3,9	3,5	3,7	3,6	3,5	3,9	3,8	4,9	3	4,5	3,7	2,6	3,2	11,7
Petroleum and coal products	0,5	0,5	0,5	0,7	0,6	0,6	0,4	0,4	0,5	0,3	0,4	0,3	0,4	0,2	0,5	0,6	0,3	0,3	
Non-metallic mineral products	0,9	0,8	2	2	2,1	2,6	2,3	1,6	1,3	3,8	1,8	1	1,8	2,5	1,1	2,2	2	0,6	
Metal products																			
Machinery	2,4	3,4	4,1	4,9	3,5	4	5	4,2	3,3	3,9	3,7	4,5	6,7	5,2	5,3	3,8	9,1	3,6	0,4
Transport equipment	1	1,3	1,9	2,3	1,8	1,4	2,5	2	1,9	1,6	2,2	1,9	2,9	4,2	3,1	5,3	6,4	7,2	0,8
Electricity gas	0,4	0,5	0,5	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,5	0,4	0,3	0,3	0,2	0,3	0,3	0,6	0,4
Construction																			
Trade, restaurants and hotels	12,6	13,8	15,4	15,2	16	16,6	16,4	16,9	17,4	18,1	18,2	17,9	19,8	21,4	18,5	18,3	20,6	24,2	21,4
Transport and communication	14,9	14,7	14,7	13	14,3	12,7	12,7	13	13,2	14,7	15,9	12,2	14,3	10,5	12	13,6	5,7	4,7	8,9
Other services	6,2	5,6	5,4	5,9	6	4,8	5,7	5,7	5,2	5,1	4,9	6,4	7,2	7	7	4,6	5,7	6,9	10,9

Source: De Santis and Ozhan (1995)

**Table 9 Indirect tax rate, tariff, quota premium,  
and common external tariff (%)**

SECTORS	$t_j$	$tm_j^{EU}$	$tm_j^{RoW}$	$qr_j^{EU}$	$cet_j^{RoW}$
<i>Agriculture</i>	0.3	18.3	17.9	0.0	12.0
<i>Mining</i>	17.1	1.0	0.9	0.0	2.4
<i>Food processed products</i>	1.0	14.8	14.2	0.0	12.0
<i>Beverages and tobacco</i>	0.8	145.0	91.9	0.0	24.0
<i>Textiles</i>	8.4	14.5	16.5	5.0	9.0
<i>Wearing apparel</i>	4.0	61.2	0.7	15.0	13.0
<i>Leather and fur products</i>	12.4	4.3	3.2	0.0	3.1
<i>Footwear</i>	4.0	166.6	32.3	0.0	11.7
<i>Wood and wood products</i>	6.7	19.1	67.9	0.0	5.7
<i>Chemical products</i>	1.1	21.9	35.0	0.0	7.3
<i>Petroleum and coal products</i>	32.8	112.1	94.6	0.0	3.1
<i>Non-metallic mineral products</i>	7.6	35.8	56.1	0.0	5.2
<i>Metal products</i>	18.9	9.6	2.9	0.0	5.1
<i>Machinery</i>	2.1	17.4	29.8	0.0	5.0
<i>Transport equipment</i>	2.6	34.2	40.6	0.0	7.0
<i>Electricity, gas and waterworks</i>	0.5	0.0	14.3	0.0	0.0
<i>Construction</i>	2.7				
<i>Trade, restaurants and hotels</i>	0.6				
<i>Transport and communication</i>	3.5				
<i>Other services</i>	11.8				

The duties levied by the EU on Turkish commodities and the European common external tariff are published by the Commission of the European Communities on an annual base (CEC, 1990). The duties levied by the EU on Turkish goods are zero. Since the EU imports a large number of differentiated commodities from non-member countries, which are subject to a large range of different duties, the



mode has been employed in this study as the average European common external tariff ( $cet_j^{RoW}$ ). With regard to the quota restriction on Turkish textiles and wearing apparel exports to the EU, the exogenous increase on the export price of these goods, used by Harrison, *et al.* (1997), is assumed to be the *ad valorem* quota premium on VERs ( $qr_j^{EU}$ ).

It is important to note for the subsequent analysis on welfare that the European common external tariff rates are lower than the tariff rates levied on Turkish imports from the RoW, with the only exemption of mining, wearing apparel and metal products. This implies that the CU should not be trade diverting.

With regard to the elasticity values, the factor substitution elasticities, the Armington trade elasticities, and the elasticities of transformation have been selected from Harrison, *et al.* (1992), and some of them have been adjusted for differences in sectoral aggregation (see Table 10). In addition, because of the lack of data, the elasticities of substitution among skilled and unskilled labour categories are assumed to be equal to 2 and 5, respectively.

**Table 10** Elasticities' values

<i>Sectors</i>	$\sigma_j$	$\epsilon_j$	$\mu_j$	$\rho_j$	$\bar{\omega}_j$
<i>Agriculture,</i>	0.945	2.000	5	2.9	5
<i>Mining</i>	0.426	0.500	5	2.9	5
<i>Food processed products</i>	0.945	1.050	5	2.9	5
<i>Beverages and tobacco</i>	0.886	1.840	5	2.9	5
<i>Textiles</i>	0.927	2.000	5	2.9	5
<i>Wearing apparel</i>	0.927	3.400	5	2.9	5
<i>Leather and fur products</i>	0.927	3.400	5	2.9	5
<i>Footwear</i>	0.927	3.400	5	2.9	5
<i>Wood and wood products</i>	0.899	2.000	5	2.9	5
<i>Chemical products</i>	1.009	1.762	5	2.9	5
<i>Petroleum and coal products</i>	0.374	0.400	5	2.9	5
<i>Non-metallic mineral products</i>	0.964	1.169	5	2.9	5
<i>Metal products</i>	0.911	0.762	5	2.9	5
<i>Machinery</i>	1.105	0.839	5	2.9	5
<i>Transport equipment</i>	1.670	1.511	5	2.9	5
<i>Electricity, gas and waterworks</i>	1.884	2.000	5	2.9	5
<i>Construction</i>	1.988	-	-	-	-
<i>Trade, restaurants and hotels</i>	1.557	2.000	5	2.9	5
<i>Transport and communication</i>	1.890	2.000	5	2.9	5
<i>Other services</i>	2.010	2.000	5	2.9	5

$\sigma_j$ : elasticity of substitution among primary factors of production;  $\epsilon_j$ : elasticity of substitution between imported and domestically produced goods;  $\mu_j$ : elasticity of substitution among imports from different regions;  $\rho_j$ : elasticity of transformation between production for exports and the domestic market;  $\bar{\omega}_j$ : elasticity of transformation among exports to different regions.

With regard to the calibration of all other parameter values, such as initial prices, direct tax rates on household income, marginal propensities to save, factor income distribution shares, shift and share parameters of different functional

forms, the standard techniques widely used in AGE literature are employed (Mansur and Whalley, 1984).

#### **4. The revenue-neutral tariff reform scenarios**

The preferential trading arrangement between Turkey and the EU is a regional economic integration agreement, signed in respect of the GATT's rules, according to which the member countries remove tariffs and quotas on mining and manufacturing commodities which circulate within the CU, and apply a common external tariff on these commodities from outside the CU. As a result, nominal protection rates on goods subject to the European CAP (that is, agricultural and food processed commodities) remain unchanged.

The indirect tax rate has been used as a policy instrument manoeuvrable by policy-makers to perform a revenue-neutral tariff reform. This experiment has been carried out under two different assumptions: firstly, real wages are assumed to be rigid (with the exception of farmers' wages), which implies that the effects of trade are manifested in changes in employment; and, secondly, real wages are assumed to be flexible and full employment is maintained.

**Table 11 The impact on output and exports** (Base year = 100)

<i>Sectors</i>	Fixed wages			Flexible wages		
	<i>Output</i>	<i>Exports EU</i>	<i>Exports RoW</i>	<i>Output</i>	<i>Exports EU</i>	<i>Exports RoW</i>
<i>Agriculture</i>	97.8	84.6	84.6	102.6	110.1	110.1
<i>Mining</i>	99.7	126.6	126.6	99.1	128.3	128.3
<i>Food processed products</i>	103.6	110.4	110.4	103.6	109.9	109.9
<i>Beverages and tobacco</i>	107.0	154.1	154.1	105.3	150.7	150.7
<i>Textiles</i>	115.0	148.2	116.1	98.8	102.6	80.4
<i>Wearing apparel</i>	94.3	108.7	54.0	121.5	162.7	80.9
<i>Leather and fur products</i>	138.1	222.3	222.3	175.6	317.2	317.2
<i>Footwear</i>	107.8	186.1	186.1	106.2	182.2	182.1
<i>Wood and wood products</i>	101.0	137.1	137.1	99.2	130.5	130.5
<i>Chemical products</i>	103.3	136.4	136.4	105.8	146.1	146.1
<i>Petroleum and coal products</i>	89.3	44.4	44.4	88.3	41.7	41.7
<i>Non-metallic mineral products</i>	103.9	146.1	146.1	101.8	135.2	135.2
<i>Metal products</i>	108.8	129.0	129.0	107.7	126.4	126.4
<i>Machinery</i>	101.3	122.5	122.5	100.6	121.4	121.4
<i>Transport equipment</i>	101.6	149.2	149.2	100.8	148.3	148.3
<i>electricity gas</i>	99.2	55.9	55.9	96.6	48.9	48.9
<i>Construction</i>	100.0	-	-	100.0	-	-
<i>Trade, restaurants and hotels</i>	100.2	98.1	98.1	97.3	89.2	89.2
<i>Transport and communication</i>	101.2	104.2	104.2	100.3	103.3	103.3
<i>Other services</i>	99.1	96.2	96.2	97.4	90.5	90.5
<i>Leysperes Quantity Index</i>	101.7	116.6	108.4	100.7	114.2	109.1

Tables 11-13 report the economic impact of policy scenarios upon sectoral output, value added, and trade flows in Turkey. Tables 14-16 show the

consequences on welfare and the distribution of income among Turkish urban and rural households. Finally, Table 17 shows the impact on Turkish employment.

It is evident from Table 11 that the partial trade liberalisation policy favours a positive re-allocation of resources in Turkey: aggregate output, measured by the Leysperes quantity index, increases by 0.7%-1.7%. The major growing sectors are food processed products, beverages and tobacco, textiles (in the scenario with fixed wages), apparel (in the scenario with flexible wages), leather and fur products, footwear, chemical and non-metallic mineral products. These are the sectors where Turkey faces a comparative advantage and is in a position to compete with foreign countries, in particular with the European member states.<sup>23</sup> Despite the elimination of the VER in textiles towards the EU market, this sector might contract (i.e. scenario with flexible wages), if it is easy to switch sales from markets which are not constrained from VERs; and this has been postulated in this model by assuming a large elasticity of transformation among goods exported towards the EU and the RoW. In contrast, apparel rises in the flexible wages case, and contracts in the fixed wage case. The explanation used for textiles is also valid for apparel. However, apparel exports towards the

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<sup>23</sup> In support of this finding, it is important to consider a study by Celasun (1994), which measures the revealed comparative advantage (RCA) for 26 Turkish industries for the period 1987-89. This study shows that the sectors having a positive RCA value are textiles-clothing-shoes, furniture, ceramic-glass, food-beverage-tobacco, rubber-plastic, petrol refineries, and iron-steel.

previously restricted EU market expand to the detriment of exports to non EU countries for two further reasons: firstly, the European common external tariff rate in apparel is larger than the tariff rate levied on Turkish apparel imports from the non member states; and secondly, the domestic demand in apparel is now satisfied by a large increase of apparel imports from the EU, which were previously protected by a huge effective tariff. The commodities which are favoured by the trade policy are industrial products to the detriment of services. Agriculture might contract as it is still heavily protected.<sup>24</sup>

**Table 12 The impact on the value added (Base year = 100)**

	Fixed wages	Flexible wages
GDP in real terms	100.9	100.5
- Agriculture	94.6	102.5
- Industry	105.4	104.1
- Services	99.1	96.8

<sup>24</sup> In the future, the liberalisation of the European CAP and the enlargement of the CU agreement to agricultural commodities might favour the expansion of Turkish agriculture.

In fact, the value added in industry increases by 4.1%-5.4%; whilst the value added in agriculture increases by 2.5% in the scenario with flexible wages, but decreases by 5.4% in the scenario with fixed wages (see Table 12). In aggregate, GDP rises by 0.5%-0.9% in real terms. Hence, as a first finding, despite the aggregate impact on GDP being modest, the value added breakdown clearly shows that resources are reallocated favouring a remarkable expansion of the Turkish industrial sectors.

Table 13 reports the impact on trade flows. The partial trade liberalisation policy in favour of the EU increases the trade budget deficit with the EU by 5.1%-38%, and raises the aggregate trade volume with respect to the GDP by almost 10%. The impact of the CU on the import volume from the EU and the RoW is an indicator of the Vinerian trade creation and trade diversion effects. The volume of imports from both regions rises, and this implies that the CU agreement is not trade diverting. The latter outcome is due to the fact that Turkish tariffs levied on goods imported from non-member states are bigger than the European common external tariffs in most commodities (see Table 9).

Also the volume of exports is positively affected by the trade policy rising by 11.9%-13%. In particular, industrial exports increase by almost 25%, especially toward the EU, thanks to the elimination of VERs in textiles and wearing apparel. So, in summary, Tables 11-13 indicate that the regional

agreement with the EU leads to an enormous re-allocation of resources in favour of manufacturing industries, expands trade volume and is not trade diverting.

**Table 13 The impact on the trade flows (Base year = 100)**

	Fixed wages	Flexible wages
Trade balance deficit	100.0	100.0
Trade balance deficit with the EU	105.1	138.0
Trade balance deficit with the RoW	99.5	95.9
Trade volume/GDP	110.2	109.7
Volume of exports	113.0	111.9
Volume of exports to the EU	116.6	114.2
Volume of exports to the RoW	108.4	109.1
Volume of imports	109.8	109.0
Volume of imports from the EU	116.0	115.5
Volume of imports from the RoW	104.8	103.8
Volume of exports in agriculture	84.6	110.1
Volume of exports in industry	125.8	125.1
Volume of exports in services	101.1	96.8
Volume of imports in agriculture	108.7	97.3
Volume of imports in industry	110.5	110.0
Volume of imports in services	100.1	100.7



**Table 14 The impact on welfare** (Billions of TL and %)

Region	Income class	Fixed wages		Flexible wages	
U r b a n  g r o u p s	1st group	16.3	1.3	2.8	0.2
	2nd group	215.5	2.9	103.0	1.4
	3rd group	180.5	1.4	- 0.2	0.0
	4th group	185.8	1.4	- 33.0	- 0.2
	5th group	166.3	1.3	- 66.6	- 0.5
	6th group	145.0	1.2	- 79.0	- 0.7
	7th group	114.2	0.9	- 142.5	- 1.2
	8th group	61.7	0.6	- 163.3	- 1.6
	9th group	106.0	1.1	- 107.8	- 1.2
	10th group	84.5	1.1	- 91.9	- 1.2
	11th group	111.8	0.7	- 278.8	- 1.9
	12th group	127.7	1.0	- 176.1	- 1.4
	13th group	13.2	0.1	- 242.6	- 2.5
	14th group	38.1	0.5	- 187.9	- 2.4
	15th group	33.1	0.6	- 132.9	- 2.3
	16th group	189.2	1.1	- 317.3	- 1.8
	17th group	161.7	1.9	- 95.7	- 1.1
	18th group	635.7	3.6	24.1	0.1
	19th group	31.4	0.5	- 155.7	- 2.6
	20th group	141.7	4.4	6.2	0.2
	<i>Urban Areas</i>	<i>2759.3</i>	<i>1.4</i>	<i>- 2135.2</i>	<i>- 0.9</i>
R u r a l  g r o u p s	1st group	3.2	0.2	31.6	2.1
	2nd group	- 1.8	0.0	127.7	2.0
	3rd group	58.1	0.5	222.6	2.1
	4th group	29.7	0.2	311.2	2.4
	5th group	- 32.1	- 0.2	285.2	2.2
	6th group	- 22.7	- 0.2	302.2	2.7
	7th group	- 4.0	0.0	301.0	3.1
	8th group	- 38.1	- 0.5	232.7	2.8
	9th group	- 58.8	- 0.8	214.6	2.8
	10th group	- 38.7	- 0.8	162.0	3.4
	11th group	- 113.0	- 1.0	346.1	3.1
	12th group	- 43.8	- 0.6	206.9	2.9
	13th group	31.3	- 0.3	102.0	2.4
	14th group	76.0	1.5	98.5	1.9
	15th group	25.5	1.0	60.5	2.3
	16th group	38.6	0.6	98.6	1.6
	17th group	16.0	0.3	168.1	3.5
	18th group	50.8	1.1	97.3	2.0
	19th group	14.8	1.9	- 7.3	- 0.9
		<i>Rural Areas</i>	<i>- 9.1</i>	<i>0.0</i>	<i>3361.4</i>
	<b>Turkey</b>	<b>2750.3</b>	<b>0.8</b>	<b>1226.3</b>	<b>0.4</b>

Table 14 reports the Hicksian equivalent variation for urban and rural household income groups and the aggregate measures of welfare. The positive sign indicates an improvement for the household in question. The Hicksian equivalent variation indices are measured as a percentage of household income. It is clear that as a consequence of the CU agreement, aggregate welfare for the nation as a whole rises, supporting the view that the preferential trading agreement with the EU is not trade diverting. In aggregate, the static welfare gains in Turkey are modest, as are typically found in most of AGE models with perfect competition and constant returns to scale, dealing with trade liberalisation issues. As a percentage of household income, they range between 0.4% in the case of flexible wages and 0.8% in the case of fixed wages. Namely, they range between 1226 and 2750 billions of 1990 Turkish lira (470-1054 million US dollars).<sup>25</sup>

The results on welfare become more attractive when the welfare impact is decomposed among urban and rural household income groups. In the scenario with flexible wages, the urban household groups suffer an aggregate welfare loss of 2135 billions of 1990 Turkish lira, whereas rural households gain 3361 billions of 1990 Turkish lira. The opposite outcome is obtained in the scenario with fixed wages. However, in this case, rural household groups suffer a negligible welfare

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<sup>25</sup> The average conversion factor for 1990 is an estimate of the IMF: 2608.6 Turkish Lira for 1 US dollar (IMF, 1995).

loss in aggregate. In summary, although the preferential trading agreement with the EU is not trade diverting, the welfare effects vary across the household groups, and according to the assumptions postulated for the labour market; the CU is potentially Pareto superior; and the welfare gains would be larger, and would benefit a greater number of household groups, if policy-makers encourage institutions to bargain a wage rate such that the real wages remain constant.

The impact on the size distribution of income, and the impact on the functional distribution of income, are shown in Tables 15 and 16. The first important finding is that the impact on overall inequality decreases in the full employment case in line with the Stolper-Samuelson theorem, but increases in the scenario with fixed wages. The second striking result is that that main source of inequality worsening (improving) is a large negative (positive) impact on the inter-group inequality among urban and rural household groups. It rises (decreases) by 6.5%-7.5% (10.3%-17.7%). These two different outcomes depend upon the performance of agricultural activities. In the scenario with fixed (flexible) wages, agriculture contracts (expands), thus reducing (increasing) agricultural capital and labour incomes (see Table 11), which are the main components of the private income in rural areas (see Table 6).

**Table 15 The impact on the size distribution of income**  
(Base year = 100)

Generalised Entropy Index	Inequality	Fixed wages	Flexible wages
- 1	Overall inequality	100.5	98.0
	Within urban areas	99.9	98.2
	Within rural areas	99.7	100.7
	Between rural-urban areas	107.5	82.3
0	Overall inequality	100.7	98.2
	Within urban areas	100.3	98.8
	Within rural areas	100.1	100.4
	Between rural-urban areas	107.4	82.5
+ 1	Overall inequality	101.5	98.2
	Within urban areas	101.0	99.5
	Within rural areas	100.7	99.9
	Between rural urban areas	106.5	89.7
+ 2	Overall inequality	103.6	97.8
	Within urban areas	102.7	100.4
	Within rural areas	101.7	98.8
	Between rural-urban areas	107.3	82.7

It is important to emphasise the robustness of these results, which are independent of the choice upon the parameter  $\theta$  used to estimate the generalised entropy indices. It must be stressed that measures with positive value of  $\theta$  are particularly sensitive to income differences at the top end of the income

distribution, whilst measures with negative value of  $\theta$  are more sensitive to very low income. This explains why the inequality within groups varies with  $\theta$ .

**Table 16 The impact on the functional distribution of income**  
(Base year = 100)

	Fixed wages	Flexible wages
<b>A -Capital income</b>	<b>100.7</b>	<b>99.1</b>
- Agricultural income	97.2	103.7
- Non-agricultural income	101.5	98.1
<b>B - Labour income</b>	<b>100.4</b>	<b>99.9</b>
<b>B.1 - Skilled labour income</b>	<b>100.6</b>	<b>98.2</b>
- Professional workers	100.3	97.9
- Managerial workers	101.5	99.0
- Clerical workers	100.6	98.2
<b>B.2 - Basic skilled labour income</b>	<b>101.8</b>	<b>99.5</b>
- Sales workers	101.2	98.5
- Service workers	100.2	99.0
- Non agricultural workers	102.4	99.7
- Other workers	102.1	99.4
<b>B.3 - No-skilled labour income</b>	<b>97.4</b>	<b>103.2</b>
- Agricultural workers	97.4	103.2
<i>Basic skilled / Skilled labour income</i>	<i>101.2</i>	<i>101.3</i>
<i>No-skilled / Skilled labour income</i>	<i>96.8</i>	<i>105.2</i>
<i>Basic skilled labour / Capital income</i>	<i>101.1</i>	<i>100.4</i>
<i>No-skilled labour / Capital income</i>	<i>96.7</i>	<i>104.2</i>

When the analysis on the income distribution effect is carried out by examining the impact on the functional distribution of income, the results clearly indicate that in the scenario with flexible wages, the four ratios between (i) basic skilled and skilled labour incomes, (ii) no-skilled and skilled labour incomes, (iii) basic skilled labour and capital incomes, (iv) no-skilled labour and capital incomes, increase in line with the Stolper-Samuelson theorem, thus favouring a more equal distribution of income (see Table 16). In contrast, in the scenario with fixed wages, agricultural workers are worse off, thus leading to a rise in inequality. From the policy making point of view, it is very important to know what the effects of trade policies on income distribution are. The computed data for Turkey indicate that, despite the validity of the Stolper-Samuelson theorem, overall income inequality might increase with trade. As a result, the analysis of the trade impact on income distribution based on simplified two-sector, two-factors models, which define household groups according to their functional role, and under the assumption of full employment, might be misleading.

Table 17 reports the results concerning the impact of the CU agreement on Turkish employment, when real wages are constant. The only exception is the treatment of the agricultural category. Since agriculture in Turkey is a family-based activity, it is assumed that any effect of the trade policy is perceived on wages. The rigid real wages lead to an expansion of the aggregate labour demand

by 1%, which implies that almost 148000 new jobs are created, as a consequence of the CU agreement. In the rigid real wage case, efficiency gains are not absorbed by wage increases but rather by employment creation.<sup>26</sup> It is interesting to note that, as a consequence of the trade policy, 75% of new jobs concern basic skilled non-agricultural workers, who are demanded by the growing manufacturing industries.

**Table 17 The impact on employment**

	Relative change (Base year = 100)	Number of new workers	Share
Labour Input	101.0	147505	1.000
- Professional workers	100.3	2827	0.019
- Managerial workers	101.5	4901	0.033
- Clerical workers	100.6	5255	0.036
- Sales workers	101.2	18606	0.126
- Service workers	100.2	3050	0.021
- Agricultural workers	100.0	0	0.000
- Non agricultural workers	102.4	110251	0.747
- Other workers	102.1	2615	0.018

<sup>26</sup> A similar result has been obtained by Mercenier (1995) in examining the impact of the European single market in 1992 on employment among the EU member states.

This finding is in line with the Krugman (1995) model if applied to a developing country, and with Wood's results, according to which the cumulative demand for labour in manufacturing from 1985 to 1990 is increased by about 23 million in developing countries (Wood, 1994).

It is important to stress that, given the ex-ante large tariff rates (see Table 9), these results are obtained if the indirect tax rates used to perform a revenue-neutral tariff reform are uniformly increased by 55.8% in the case of fixed real wages, and by 57.6% in the case of flexible real wages. In other words, the standard VAT rate should rise from 12% (the prevailing rate in Turkey in 1990) to 18.7%-18.9%, which is reasonably close to the standard VAT rate applied in most of the European member states.

To evaluate the robustness of the above results, sensitivity analysis on the elasticity values has been carried out. All elasticities employed in this study have been divided by a factor of two in order to simulate the effects of the CU on a more rigid economy, and multiplied by a factor of two in order to consider the case of a more flexible economy. The results reported in Appendix C clearly show that the direction of the variable changes is robust, however their precise size depends upon the value of the elasticities. Some variation in the individual sectoral impact also exists. In the case of flexible wages, Turkey's welfare gains range between 75 (less flexible economy) and 4124 (more flexible economy)



billions of 1990 Turkish lira, and the change in income inequality between rural and urban groups measured by the Theil index ( $\theta = 1$ ) ranges between - 8.5% (less flexible economy) and 0.6% (more flexible economy). In the case of fixed real wages, Turkey's welfare gains range between 1406 (less flexible economy) and 8433 (more flexible economy) billions of 1990 Turkish lira, and the change in inequality between groups ranges between 7.9% (less flexible economy) and 15.3% (more flexible economy). The impact on employment ranges between 86000 (less flexible economy) and 432000 (more flexible economy) new jobs. Similar gaps exist for all other statistics estimated in the previous tables.

In conclusion, the numerical results suggest that the CU agreement is not trade diverting; it raises welfare, output, GDP and trade volume in Turkey. Despite the higher demand of basic skilled labour, in line with the Stolper-Samuelson model, this trade agreement causes an increase in overall income inequality in the scenario with fixed wages, mainly due to the rising gap between rural and urban incomes as a consequence of the contraction of the agricultural sector still heavily protected by trade barriers. In addition, it seems that this trade policy, accompanied by a fixed real wage policy allowing the creation of new jobs, raises Turkey's welfare, GDP, and output far greater than in the case of flexible wages.

## 5. Conclusions

The aim of this study is to analyse the impact of the CU agreement between Turkey and the EU on the welfare and the size distribution of income among urban and rural Turkish households; and on Turkey's employment, sectoral output, GDP and trade flows. In order to examine the impact of the CU upon employment in Turkey, two main cases have been considered for the labour market: the standard case of flexible real wages with full employment, and the case of fixed real wages.

The numerical simulations show that the CU agreement with the EU is not trade diverting, raises the trade volume-GDP ratio and that resources are reallocated towards the industrial sector, which expands by 4.1%-5.4%. With regard to welfare, although aggregate gains are equal to 1226-2750 billions of 1990 Turkish lira, the impact on urban and rural households' welfare highly depends upon the assumption postulated for the labour market. In the scenario with fixed wages, urban households are better off and rural households are worse off; in the scenario with flexible wages, urban household are worse off and rural households are better off. However, in the fixed wage case, a large welfare gain in urban areas is accompanied by a negligible welfare loss among rural households.

The second important result is related to the issue of international trade and income inequality. Despite the owners of basic skilled labour being better off than both the owners of skilled labour and the owners of capital, in line with the Stolper-Samuelson theorem (as Turkey is a middle income developing country and, therefore, abundant of the basic skilled labour factor), overall income inequality measured by the size distribution of income might rise. In the scenario with fixed wages, the main source of income inequality is the inter-income inequality between urban and rural areas, which rises by almost 7%, due to an output fall in agriculture, a sector still protected and the principal income source of rural households. This result suggests that theoretical and applied analysis of trade impact on the distribution of income, carried out only with models which define household groups according to their functional role and under the full employment assumption, might be misleading.

As far as the issue of international trade and employment is concerned, if real wages are rigid, the preferential trading agreement with the EU leads to a rise in employment, as one would expect from the Krugman model applied to a developing country. The efficiency gains with trade, not being absorbed by a wage increase, generate the creation of 148000 new jobs (432000 in the case of a more flexible economy), mainly basic skilled non-agricultural workers.

Finally, the welfare gains and the incremental GDP would be larger, if policy-makers encourage institutions to bargain a wage rate, such that real wages remain constant. The sensitivity analysis on elasticities values confirm the overall conclusion that the preferential trading agreement with the EU, accompanied by a fixed real wage policy, creates new jobs in Turkey, raises Turkey's welfare, output and GDP far greater than in the case of flexible wages, but also increases income inequality.

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## Appendix A Numerical model: The CU agreement

This appendix reports the algebraic formulation of the numerical model employed to study the economic impact and the income distribution effects of the CU agreement between Turkey and the EU on the Turkish economy. The appendix has been split into eight sections: (i) equations related to prices; (ii) equations related to production and factor demand; (iii) equations related to domestic and foreign trade; (iv) equations related to income; (v) equations related to taxes; (vi) equation related to savings and investment; (vii) equation related to final demand and intermediate demand; (viii) equations related to the market clearing conditions.

### [A.1] Price equations

$$(A1) \quad p_j = \Delta_j^{-1} (1 + t_j) \left[ \zeta_j^{\varepsilon_j} pm_j^{C^{1-\varepsilon_j}} + (1 - \zeta_j)^{\varepsilon_j} pd_j^{1-\varepsilon_j} \right]^{1/(1-\varepsilon_j)}$$

$$(A2) \quad pm_j^C = A_j^{-1} \left[ \alpha_j^{\mu_j} pm_j^{EU^{1-\mu_j}} + (1 - \alpha_j)^{\mu_j} pm_j^{RoW^{1-\mu_j}} \right]^{1/(1-\mu_j)}$$

$$(A3) \quad pm_j^{EU} = \overline{pwm}_j^{EU} (1 + tm_j^{EU})$$

$$(A4) \quad pm_j^{RoW} = \overline{pwm}_j^{RoW} (1 + tm_j^{RoW})$$

$$(A5) \quad py_i = \Phi_i^{-1} \left[ \varphi_i^{\phi_i} pd_i^{1-\phi_i} + (1 - \varphi_i)^{\phi_i} pe_i^{C^{1-\phi_i}} \right]^{1/(1-\phi_i)}$$

$$(A6) \quad pe_i^C = B_i^{-1} \left[ \beta_i^{\eta_i} pe_i^{EU^{1-\eta_i}} + (1-\beta_i)^{\eta_i} \overline{pwe}_i^{RoW^{1-\eta_i}} \right]^{1/(1-\eta_i)}$$

$$(A7) \quad pe_i^{EU} = \frac{\overline{pwe}_i^{EU}}{1+qr_i^{EU}}$$

$$(A8) \quad pv_i = X_i^{-1} \left[ \gamma_i^s \sigma_i w_i^s (1-\sigma_i) + \gamma_i^u \sigma_i w_i^u (1-\sigma_i) + (1-\gamma_i^s - \gamma_i^u)^{\sigma_i} r^{(1-\sigma_i)} \right]^{1/(1-\sigma_i)}$$

$$(A9) \quad w_i^s = H_i^{s-1} \left[ \sum_s \delta_{is}^{\xi_i^s} w_s^{1-\xi_i^s} \right]^{1/(1-\xi_i^s)}$$

$$(A10) \quad w_i^u = H_i^{u-1} \left[ \sum_u \delta_{iu}^{\xi_i^u} w_u^{1-\xi_i^u} \right]^{1/(1-\xi_i^u)}$$

$$(A11) \quad \overline{\Omega} = \frac{\sum_j pd_j \overline{D}_j}{\sum_j pd_j \overline{D}_j}$$

### [A.2] Production and factor inputs equations

$$(A12) \quad Y_i = \min \left[ \frac{x_{ji}}{a_{ji}}, \frac{V_i}{a_i^v} \right]$$

$$(A13) \quad V_i = X_i \left[ \gamma_i^s AL_i^{s(\sigma_i-1)/\sigma_i} + \gamma_i^u AL_i^{u(\sigma_i-1)/\sigma_i} + (1-\gamma_i^s - \gamma_i^u) AK_i^{(\sigma_i-1)/\sigma_i} \right]^{\sigma_i/(\sigma_i-1)}$$

$$(A14) \quad AL_i^s = X_i^{-1} \left( \gamma_i^s \frac{pv_i}{w_i^s} \right)^{\sigma_i} V_i$$

$$(A15) \quad AL_i^u = X_i^{-1} \left( \gamma_i^u \frac{pV_i}{w_i^u} \right)^{\sigma_i} V_i$$

$$(A16) \quad AK_i = X_i^{-1} \left[ \left( 1 - \gamma_i^s - \gamma_i^u \right) \frac{pV_i}{r} \right]^{\sigma_i} V_i$$

$$(A17) \quad L_{is} = H_i^{s(\xi_i-1)} \left( \delta_{is} \frac{w_i^s}{w_s} \right)^{\xi_i^s} AL_i^s$$

$$(A18) \quad L_{iu} = H_i^{u(\xi_i^u-1)} \left( \delta_{iu} \frac{w_i^u}{w_u} \right)^{\xi_i^u} AL_i^u$$

### [A.3] Trade equations

$$(A19) \quad Q_i = \Delta_i \left[ \zeta_i M_i^{C(\varepsilon_i-1)/\varepsilon_i} + (1 - \zeta_i) D_i^{(\varepsilon_i-1)/\varepsilon_i} \right]^{\varepsilon_i/(\varepsilon_i-1)}$$

$$(A20) \quad \frac{M_j^C}{D_j} = \left( \frac{1 - \zeta_j}{\zeta_j} \right)^{-\varepsilon_j} \left( \frac{pd_j}{pm_j^C} \right)^{\varepsilon_j}$$

$$(A21) \quad M_j^{EU} = A_j^{\mu_j-1} \alpha_j^{\mu_j} \left( \frac{pm_j^{EU}}{pm_j^C} \right)^{-\mu_j} M_j^C$$

$$(A22) \quad M_j^{RoW} = A_j^{\mu_j-1} (1 - \alpha_j)^{\mu_j} \left( \frac{pm_j^{RoW}}{pm_j^C} \right)^{-\mu_j} M_j^C$$

$$(A23) \quad Y_i = \Phi_i \left[ \varphi_i E_i^{C(\phi_i+1)/\phi_i} + (1 - \varphi_i) D_i^{(\phi_i+1)/\phi_i} \right]^{\phi_i/(\phi_i+1)}$$

$$(A24) \quad \frac{E_i}{D_i} = \left( \frac{1 - \varphi_i}{\varphi_i} \right)^{-\phi_i} \left( \frac{pe_i^C}{pd_i} \right)^{\phi_i}$$

$$(A25) \quad E_i^{EU} = B_i^{-1} \left[ \beta_i + \beta_i^{\eta_i+1} (1 - \beta_i)^{-\eta_i} \left( \frac{pe_i^{EU}}{pwe_i^{RoW}} \right)^{-(\eta_i+1)} \right]^{-\left( \frac{\eta_i}{\eta_i+1} \right)} E_i^C$$

$$(A26) \quad E_i^{RoW} = B_i^{-1} \left[ (1 - \beta_i) + \beta_i^{-\eta_i} (1 - \beta_i)^{\eta_i+1} \left( \frac{pwe_i^{RoW}}{pe_i^{EU}} \right)^{-(\eta_i+1)} \right]^{-\left( \frac{\eta_i}{\eta_i+1} \right)} E_i^C$$

#### [A.4] Income equations

$$(A27) \quad VER_i^{EU} = qr_i^{EU} pe_i^{EU} E_i^{EU}$$

$$(A28) \quad HR_h = \sum_s \zeta_{hs}^L \sum_i w_s L_{is} + \sum_u \zeta_{hu}^L \sum_i w_u L_{iu} + \zeta_h^{agr} \left( r \tilde{AK}^{agr} - \overline{DEPK}^{agr} \right) \\ + \zeta_h^{nagr} \left( \sum_{nagr} r \tilde{AK}_{nagr} - \overline{DEPK}^{nagr} + \sum_i VER_i^{EU} \right)$$

$$(A29) \quad R = VATTAX + CONTAX + DTAX + TARIFF$$

#### [A.5] Tax equations

$$(A30) \quad DTAX = \sum_h td_h (1 - \tau_h) HR_h$$

$$(A31) \quad VATTAX = \sum_{nf} t_{nf} (pd_{nf} D_{nf} + pm_{nf}^C M_{nf}^C - p_{nf} X_{nf}) \quad (\text{non fuel goods})$$

$$(A32) \quad CONTAX = \sum_f t_f (pd_f D_f + pm_f^C M_f^C) \quad (\text{fuel}) \quad j = nf \cup f$$

$$(A33) \quad TARIFF = \sum_j tm_j^{EU} \overline{pwm}_j^{EU} M_j^{EU} + \sum_j tm_j^{RoW} \overline{pwm}_j^{RoW} M_j^{RoW}$$

[4.A.6] Savings and investment equations

$$(A34) \quad S_h = \tau_h(1 - td_h)HR_h$$

$$(A35) \quad \overline{BD} = \overline{TGC} - R$$

$$(A36) \quad SAV = \sum_h S_h + \overline{DEPK} + \overline{CA} - \overline{BD}$$

$$(A37) \quad I_j = \theta_j \overline{INV}$$

[A.7] Expenditure equations

$$(A38) \quad X_j = \sum_i a_{ji} Y_i$$

$$(A39) \quad C_j = \sum_h \vartheta_{jh} (1 - \tau_h) (1 - td_h) \frac{HR_h}{p_j}$$

$$(A40) \quad GC_j = \varpi_j \overline{TGC}$$

[A.8] Market clearing conditions

$$(A41) \quad Q_j = C_j + GC_j + X_j + I_j$$

$$(A42) \quad \sum_i \overline{pwe}_i^{EU} E_i^{EU} + \sum_i \overline{pwe}_i^{RoW} E_i^{RoW} + \overline{CA} = \\ \sum_j \overline{pwm}_j^{EU} M_j^{EU} + \sum_j \overline{pwm}_j^{RoW} M_j^{RoW}$$

$$(A43) \quad LAB_s = \sum_i L_{is}$$

$$(A44) \quad LAB_u = \sum_i L_{iu}$$

$$(A45) \quad \overline{CAP} = \sum_i AK_i$$

$$(A46) \quad SAV = \overline{INV}$$

*Variables (\*):*

$AK_i$  Aggregate capital

$\overline{BD}$  Budget deficit

$C_j$  Private demand of goods

$\overline{CA}$  Current account deficit

$\overline{CAP}$  Aggregate capital stock

$CONTAX$  Consumption tax on fuel

$D_j$  Domestically produced commodities

$\overline{D}_j$  Domestically produced commodities in the base year

$\overline{DEPK}^{agr}$	Fixed capital depreciation in agriculture
$\overline{DEPK}^{nagr}$	Fixed capital depreciation in non-agricultural activities
$DTAX$	Direct tax
$E_i^C$	Aggregate exports
$E_i^{EU}$	Exports to the EU
$E_i^{RoW}$	Exports to the RoW
$GC_j$	Government spending on goods
$I_j$	Investment by sector of destination
$\overline{INV}$	Aggregate investment
$L_{is}$	Sectoral skilled labour
$L_{iu}$	Sectoral unskilled labour
$LAB_s$	Aggregate skilled labour
$LAB_u$	Aggregate unskilled labour
$M_j^C$	Aggregate imports
$M_j^{EU}$	Imports from the EU
$M_j^{RoW}$	Imports from the RoW
$p_j$	Price of the Armington good
$pd_j$	Price of domestically produced commodities



$\overline{pd}_j$	Price of domestically produced commodities in the base year
$pe_i^C$	Composite price of exports
$pe_i^{EU}$	Supply price of exports to the EU
$pm_j^C$	Composite price of imports
$pm_j^{EU}$	Domestic price of imports from the EU
$pm_j^{RoW}$	Domestic price of imports from the RoW
$py_i$	Aggregate producer price
$\overline{pwe}_i^{EU}$	Price of exports to the EU prevailing in the EU market
$\overline{pwe}_i^{RoW}$	Price of exports to the RoW prevailing in the RoW market
$\overline{pwm}_j^{EU}$	Price of imports produced by the EU net of duties
$\overline{pwm}_j^{RoW}$	Price of imports produced by the RoW net of duties
$R$	Government revenues
$r$	Rent on capital inputs
$S_h$	Household savings
$SAV$	Aggregate savings
$TARIFF$	Tariffs
$\overline{TGC}$	Aggregate government spending on goods
$V_i$	Value added

$VATTAX$	Value added tax on goods and services (Non fuel)
$VER_i^{EU}$	Rents from voluntary export restraints agreements with the EU
$x_{ji}$	Raw-material inputs
$X_j$	Aggregate intermediate demand
$Y_i$	Output by sectors
$w_s$	Wage of skilled labours
$w_u$	Wage of unskilled labours
$w_i^s$	Average wage of skilled labour
$w_i^u$	Average wage of unskilled labour
$\bar{\Omega}$	Aggregate domestic price index - numeraire

#### Parameters

$a_i^v$	Value added requirement per unit of sectoral output
$a_{ij}$	Leontief input-output coefficients
$qr_i^{EU}$	<i>Ad valorem</i> export quota premium
$t_j$	Indirect tax rate on goods and services
$td_h$	Direct tax rate on household income

$tm_j^{EU}$	Effective import tariff rates on EU goods
$tm_j^{RoW}$	Effective import tariff rates on RoW goods
$\alpha_j$	Share parameter in the second nest Armington function
$\beta_j$	Share parameter in the second nest CET aggregation function
$\delta_{is}$	Share parameter of skilled labour function
$\delta_{iu}$	Share parameter of unskilled labour function
$\gamma_i^s$	Share parameter of the value added function
$\gamma_i^u$	Share parameter of the value added function
$\varepsilon_j$	Elasticity of substitution between imported and domestic goods
$\varphi_i$	Share parameter in the first nest CET aggregation function
$\phi_i$	Elasticity of transformation between exports and domestic goods
$\theta_j$	Investment share on commodities.
$\eta_i$	Elasticity of transformation among exports to different regions
$\zeta_j$	Share parameter in the first nest Armington aggregation function
$\tau_h$	Household marginal propensity to save
$\sigma_i$	Elasticity of substitution among primary factors of production
$\zeta_h^{agr}$	Share parameter of the agricultural capital income to households
$\zeta_{hs}^L$	Share parameters of skilled labour income to households

$\zeta_{hu}^L$	Share parameters of unskilled labour income to households
$\zeta_h^{nagr}$	Share parameters of non-agricultural capital incomes to households
$\xi_i^s$	Elasticity of substitution among skilled labours
$\xi_i^u$	Elasticity of substitution among unskilled labours
$\bar{\omega}_j$	Fixed shares of government spending on goods
$\bar{\vartheta}_{jh}$	Fixed shares of household spending on goods
$\mu_j$	Elasticity of substitution among imports from different regions
$A_j$	Shift parameter in the second nest Armington function
$B_i$	Shift parameter in the second nest CET aggregation function
$X_i$	Shift parameter of the value added function
$\Delta_j$	Shift parameter in the first nest Armington trade aggregation function
$\Phi_i$	Shift parameter in the first nest CET aggregation function
$H_i^s$	Shift parameter in the aggregate skilled labour function
$H_i^u$	Shift parameter in the aggregate unskilled labour function

(\*) Parameter and variables with a bar are set exogenously

## Appendix B The measurement of inequality

The study focuses on the inequality “within” and “between” urban and rural groups. The data source does not provide any additional information concerning the income redistribution within each income class group. Thus, complete equality between household members within each income class group is postulated and the income arithmetic mean for each representative household member of a given income class group,  $hr_h$ , divided by the so called “true” cost of living index,  $P_h$ , (Shoven and Whalley, 1992) is employed to measure income inequality.

Jenkins (1991) and Cowell (1995) investigate the properties of different measures of inequality widely used in the economics literature in a simple fashion. It can be shown that for  $\theta$  approaching zero,

$$(B1) \quad \lim_{\theta \rightarrow 0} GE_{\theta} = -\frac{1}{K} \sum_{h=1}^H k_h \log\left(\frac{hr_h/P_h}{hr^m}\right),$$

and that for  $\theta$  approaching one,

$$(B2) \quad \lim_{\theta \rightarrow 1} GE_{\theta} = \frac{1}{K} \sum_{h=1}^H k_h \left(\frac{hr_h/P_h}{hr^m}\right) \log\left(\frac{hr_h/P_h}{hr^m}\right).$$

As reported by Cowell (1984), the disaggregated version of the generalised entropy measure is given by:

$$(B3) \quad GE_{\theta} = \sum_{g=1}^G i_g^{\theta} m_g^{1-\theta} GE_{\theta w} + GE_{\theta b},$$

where  $GE_{\theta w}$  and  $GE_{\theta b}$  represent the inequality measure “within” and “between” each group  $g$ , respectively;  $i_g$  the share of total income held by  $g$ 's household members;  $m_g$  the  $g$ 's population share; and  $G$  the number of mutually exclusive groups, that is the urban and the rural groups.

$GE_{\theta w}$  is calculated as if each group were a separate population, whilst  $GE_{\theta b}$  is derived by assuming that every household member within a given group receive the  $g$ 's mean income (Jenkins, 1991):

$$(B4) \quad GE_{\theta b} = \frac{1}{\theta^2 - \theta} \left[ \sum_{g=1}^G m_g \left( \frac{hr_g^m}{hr^m} \right)^{\theta} - 1 \right],$$

where  $hr_g^m$  is the mean income within the group in real terms.

Jenkins (1991) also shows that:

$$(B5) \quad \lim_{\theta \rightarrow 0} GE_{\theta b} = - \sum_{g=1}^G m_g \log(hr_g^m / hr^m),$$

and that

$$(B6) \quad \lim_{\theta \rightarrow 1} GE_{\theta b} = \sum_{g=1}^G i_g \log(hr_g^m / hr^m).$$

## Appendix C Results of the sensitivity analysis

The figures reported in this appendix arise from the sensitivity analysis of the model to the elasticities values. The columns, which are stated “low”, show the counterfactual in the case of all elasticities divided by factor two. The columns, which are stated “high”, show the counterfactual in the case of all elasticities multiplied by factor two. The columns, which are stated “standard”, show the counterfactual with the regular elasticities as reported in the main text.

**Table C1 The impact on output** (Base year = 100)

<i>Sectors</i>	Fixed wages			Flexible wages		
	<i>Standard</i>	<i>Low</i>	<i>High</i>	<i>Standard</i>	<i>Low</i>	<i>High</i>
<i>Agriculture</i>	97.8	97.4	95.8	102.6	101.5	99.5
<i>Mining</i>	99.7	97.3	108.9	99.1	101.4	101.2
<i>Food processed products</i>	103.6	100.2	104.6	103.6	110.0	111.3
<i>Beverages and tobacco</i>	107.0	104.8	113.9	105.3	102.4	111.5
<i>Textiles</i>	115.0	111.2	94.1	98.8	96.7	102.9
<i>Wearing apparel</i>	94.3	108.4	109.7	121.5	94.6	98.5
<i>Leather and fur products</i>	138.1	120.6	177.5	175.6	138.2	146.5
<i>Footwear</i>	107.8	100.2	83.2	106.2	99.3	80.8
<i>Wood and wood products</i>	101.0	97.0	104.4	99.2	100.1	102.1
<i>Chemical products</i>	103.3	101.6	110.0	105.8	101.3	103.1
<i>Petroleum and coal products</i>	89.3	93.0	92.7	88.3	94.6	93.0
<i>Non-metallic mineral products</i>	103.9	99.8	108.0	101.8	97.7	104.4
<i>Metal products</i>	108.8	101.4	114.4	107.7	104.5	101.7
<i>Machinery</i>	101.3	100.6	104.8	100.6	98.5	99.2
<i>Transport equipment</i>	101.6	101.2	104.1	100.8	100.4	100.0
<i>Electricity, gas and waterworks</i>	99.2	98.5	100.0	96.6	96.0	96.6
<i>Construction</i>	100.0	100.0	100.0	100.0	100.0	100.0
<i>Trade, restaurants and hotels</i>	100.2	101.1	103.0	97.3	96.4	94.1
<i>Transport and communication</i>	101.2	102.2	102.4	100.3	105.9	108.2
<i>Other services</i>	99.1	99.2	98.1	97.4	97.0	96.9
<i>Leysperes Quantity Index</i>	101.7	100.5	101.8	100.7	100.5	100.8

**Table C2 The impact on exports to the EU** (Base year = 100)

<i>Sectors</i>	Fixed wages			Flexible wages		
	<i>Standard</i>	<i>Low</i>	<i>High</i>	<i>Standard</i>	<i>Low</i>	<i>High</i>
<i>Agriculture</i>	84.6	91.2	64.9	110.1	102.4	84.6
<i>Mining</i>	126.6	104.5	175.1	128.3	124.7	126.5
<i>Food processed products</i>	110.4	100.3	112.9	109.9	124.7	145.2
<i>Beverages and tobacco</i>	154.1	112.3	396.8	150.7	108.5	387.2
<i>Textiles</i>	148.2	127.3	103.4	102.6	101.5	130.6
<i>Wearing apparel</i>	108.7	125.9	163.6	162.7	103.3	140.6
<i>Leather and fur products</i>	222.3	150.0	378.9	317.2	212.2	278.4
<i>Footwear</i>	186.1	107.3	394.2	182.2	106.5	378.9
<i>Wood and wood products</i>	137.1	97.0	298.2	130.5	111.2	276.0
<i>Chemical products</i>	136.4	111.6	217.6	146.1	111.6	189.7
<i>Petroleum and coal products</i>	44.4	68.7	86.8	41.7	70.5	84.0
<i>Non-metallic mineral products</i>	146.1	105.8	233.6	135.2	96.3	203.6
<i>Metal products</i>	129.0	104.2	147.9	126.4	116.3	111.1
<i>Machinery</i>	122.5	105.8	181.1	121.4	98.6	147.7
<i>Transport equipment</i>	149.2	115.1	253.2	148.3	113.3	227.6
<i>Electricity, gas and waterworks</i>	55.9	81.6	34.5	48.9	68.8	26.6
<i>Trade, restaurants and hotels</i>	98.1	101.8	108.8	89.2	90.7	68.8
<i>Transport and communication</i>	104.2	106.6	107.2	103.3	117.8	138.8
<i>Other services</i>	96.2	99.5	82.0	90.5	92.0	78.3
<i>Leysperes Quantity Index</i>	116.6	111.1	127.6	114.2	106.0	128.3



**Table C3 The impact on exports to the RoW (Base year = 100)**

<i>Sectors</i>	Fixed wages			Flexible wages		
	<i>Standard</i>	<i>Low</i>	<i>High</i>	<i>Standard</i>	<i>Low</i>	<i>High</i>
<i>Agriculture</i>	84.6	91.2	64.9	110.1	102.4	84.6
<i>Mining</i>	126.6	104.5	175.1	128.3	124.7	126.5
<i>Food processed products</i>	110.4	100.3	112.9	109.9	124.7	145.2
<i>Beverages and tobacco</i>	154.1	112.3	396.8	150.7	108.5	387.2
<i>Textiles</i>	116.1	112.7	63.5	80.4	89.9	80.2
<i>Wearing apparel</i>	54.0	88.8	40.4	80.9	72.9	34.8
<i>Leather and fur products</i>	222.3	150.0	378.9	317.2	212.2	278.4
<i>Footwear</i>	186.1	107.3	394.2	182.1	106.5	378.9
<i>Wood and wood products</i>	137.1	97.0	298.2	130.5	111.2	276.0
<i>Chemical products</i>	136.4	111.6	217.6	146.1	111.6	189.7
<i>Petroleum and coal products</i>	44.4	68.7	86.8	41.7	70.5	84.0
<i>Non-metallic mineral products</i>	146.1	105.8	233.6	135.2	96.3	203.6
<i>Metal products</i>	129.0	104.2	147.9	126.4	116.3	111.1
<i>Machinery</i>	122.5	105.8	181.1	121.4	98.6	147.7
<i>Transport equipment</i>	149.2	115.1	253.2	148.3	113.3	227.6
<i>Electricity, gas and waterworks</i>	55.9	81.6	34.5	48.9	68.8	26.6
<i>Trade, restaurants and hotels</i>	98.1	101.8	108.8	89.2	90.7	68.8
<i>Transport and communication</i>	104.2	106.6	107.2	103.3	117.8	138.8
<i>Other services</i>	96.2	99.5	82.0	90.5	92.0	78.3
<i>Leysperes Quantity Index</i>	108.4	103.6	128.9	109.1	108.2	125.8

**Table C4 The impact on the value added (Base year = 100)**

	Fixed wages			Flexible wages		
	<i>Standard</i>	<i>Low</i>	<i>High</i>	<i>Standard</i>	<i>Low</i>	<i>High</i>
GDP in real terms	100.9	100.5	102.2	100.5	100.3	101.2
- Agriculture	94.6	95.4	92.0	102.5	99.9	96.0
- Industry	105.4	102.4	108.0	104.1	101.9	106.3
- Services	99.1	100.5	100.5	96.8	99.1	98.6

**Table C5 The impact on the trade flows** (Base year = 100)

	Fixed wages			Flexible wages		
	Standard	Low	High	Standard	Low	High
Trade balance deficit	100.0	100.0	100.0	100.0	100.0	100.0
Trade balance deficit with the EU	105.1	77.5	322.2	138.0	152.8	299.3
Trade balance deficit with the RoW	99.5	102.4	76.1	95.9	94.3	78.5
Trade volume/GDP	110.2	106.1	121.6	109.7	105.7	121.9
Volume of exports	113.0	107.7	128.2	111.9	107.0	127.1
Volume of exports to the EU	116.6	111.1	127.6	114.2	106.0	128.3
Volume of exports to the RoW	108.4	103.6	128.9	109.1	108.2	125.8
Volume of imports	109.8	105.8	121.3	109.0	105.3	120.5
Volume of imports from the EU	116.0	109.3	138.1	115.5	108.6	137.5
Volume of imports from the RoW	104.8	103.1	107.9	103.8	102.7	106.9
Volume of exports in agriculture	84.6	91.2	64.9	110.1	102.4	84.6
Volume of exports in industry	125.8	112.3	153.1	125.1	108.7	147.9
Volume of exports in services	101.1	104.2	106.1	96.8	105.5	107.5
Volume of imports in agriculture	108.7	102.2	127.3	97.3	100.9	112.1
Volume of imports in industry	110.5	106.4	122.4	110.0	105.9	122.1
Volume of imports in services	100.1	98.9	100.8	100.7	98.0	100.5

**Table C6 The impact on the welfare of urban households**

Unit of measure	Income class	Fixed wages			Flexible wages		
		<i>Standard</i>	<i>Low</i>	<i>High</i>	<i>Standard</i>	<i>Low</i>	<i>High</i>
B i l l i o n s o f T L	1st group	16.3	2.1	52.8	2.8	- 0.5	11.2
	2nd group	215.5	116.3	448.4	103.0	26.2	228.2
	3rd group	180.5	79.1	481.2	- 0.2	- 82.9	152.1
	4th group	185.8	103.1	506.9	- 33.0	- 93.2	158.5
	5th group	166.3	101.2	467.1	- 66.6	- 91.2	147.0
	6th group	145.0	99.9	422.5	- 79.0	- 85.1	132.4
	7th group	114.2	89.8	414.0	- 142.5	- 129.9	109.9
	8th group	61.7	48.9	332.1	- 163.3	- 150.9	64.7
	9th group	106.0	96.6	360.0	- 107.8	- 102.6	102.6
	10th group	84.5	77.8	290.1	- 91.9	- 83.4	88.8
	11th group	111.8	111.0	547.6	- 278.8	- 247.7	120.6
	12th group	127.7	122.3	482.4	- 176.1	- 172.0	137.0
	13th group	13.2	25.7	323.5	- 242.6	- 224.3	45.2
	14th group	38.1	36.9	297.6	- 187.9	- 181.4	45.8
	15th group	33.1	31.6	217.0	- 132.9	- 146.3	22.9
	16th group	189.2	210.4	754.0	- 317.3	- 308.3	181.1
	17th group	161.7	146.0	448.9	- 95.7	- 119.7	154.6
	18th group	635.7	595.2	1246.8	24.1	- 68.9	503.5
	19th group	31.4	50.3	203.7	- 155.7	- 144.7	- 0.8
	20th group	141.7	138.3	252.1	6.2	- 26.3	82.2
%	1st group	101.3	100.2	104.1	100.2	100.0	100.9
	2nd group	102.9	101.6	106.0	101.4	100.4	103.1
	3rd group	101.4	100.6	103.8	100.0	99.3	101.2
	4th group	101.4	100.8	103.8	99.8	99.3	101.2
	5th group	101.3	100.8	103.6	99.5	99.3	101.1
	6th group	101.2	100.9	103.6	99.3	99.3	101.1
	7th group	100.9	100.7	103.4	98.8	98.9	100.9
	8th group	100.6	100.5	103.2	98.4	98.5	100.6
	9th group	101.1	101.0	103.9	98.8	98.9	101.1
	10th group	101.1	101.1	103.9	98.8	98.9	101.2
	11th group	100.7	100.7	103.7	98.1	98.3	100.8
	12th group	101.0	101.0	103.9	98.6	98.6	101.1
	13th group	100.1	100.3	103.3	97.5	97.7	100.5
	14th group	100.5	100.5	103.8	97.6	97.7	100.6
	15th group	100.6	100.5	103.8	97.7	97.5	100.4
	16th group	101.1	101.2	104.2	98.2	98.3	101.0
	17th group	101.9	101.7	105.2	98.9	98.6	101.8
	18th group	103.6	103.4	107.0	100.1	99.6	102.8
	19th group	100.5	100.8	103.4	97.4	97.6	100.0
	20th group	104.4	104.3	107.9	100.2	99.2	102.6

**Table C7 The impact on the welfare of rural households**

Unit of measure	Income class	Fixed wages			Flexible wages		
		<i>Standard</i>	<i>Low</i>	<i>High</i>	<i>Standard</i>	<i>Low</i>	<i>High</i>
B i l i o n s o f T L	1st group	3.2	- 12.2	20.8	31.6	25.3	18.0
	2nd group	- 1.8	- 52.6	46.3	127.7	95.4	65.5
	3rd group	58.1	- 27.6	151.8	222.6	152.6	168.2
	4th group	29.7	- 78.1	78.1	311.2	213.2	191.6
	5th group	- 32.1	- 114.0	- 19.4	285.2	200.4	141.3
	6th group	- 22.7	- 107.9	- 35.6	302.2	208.2	140.7
	7th group	- 4.0	- 92.5	- 49.6	301.0	218.9	136.5
	8th group	- 38.1	- 91.9	- 92.2	232.7	190.3	89.3
	9th group	- 58.8	- 107.8	- 113.2	214.6	181.4	67.6
	10th group	- 38.7	- 73.7	- 91.1	162.0	117.3	50.0
	11th group	- 113.0	- 160.1	- 231.3	346.1	301.3	88.6
	12th group	- 43.8	- 89.6	- 89.9	206.9	165.4	72.7
	13th group	31.3	14.3	42.9	102.0	83.2	69.8
	14th group	76.0	41.4	114.6	98.5	65.3	96.2
	15th group	25.5	10.1	40.9	60.5	46.9	51.3
	16th group	38.6	30.5	53.7	98.6	90.6	71.6
	17th group	16.0	- 14.1	- 21.6	168.1	104.3	57.3
	18th group	50.8	31.9	59.3	97.3	51.0	56.4
	19th group	14.8	16.8	20.1	- 7.3	- 2.5	3.2
%	1st group	100.2	99.2	101.4	102.1	101.7	101.2
	2nd group	100.0	99.2	100.7	102.0	101.5	101.0
	3rd group	100.5	99.7	101.4	102.1	101.4	101.6
	4th group	100.2	99.4	100.6	102.4	101.7	101.5
	5th group	99.8	99.1	99.8	102.2	101.6	101.1
	6th group	99.8	99.0	99.7	102.7	101.9	101.3
	7th group	100.0	99.0	99.5	103.1	102.3	101.4
	8th group	99.5	98.9	98.9	102.8	102.3	101.1
	9th group	99.2	98.6	98.5	102.8	102.4	100.9
	10th group	99.2	98.5	98.1	103.4	102.4	101.0
	11th group	99.0	98.6	97.9	103.1	102.7	100.8
	12th group	99.4	98.7	98.7	102.9	102.3	101.0
	13th group	100.7	100.3	101.0	102.4	102.0	101.6
	14th group	101.5	100.8	102.2	101.9	101.3	101.9
	15th group	101.0	100.4	101.6	102.3	101.8	102.0
	16th group	100.6	100.5	100.9	101.6	101.5	101.2
	17th group	100.3	99.7	99.6	103.5	102.2	101.2
	18th group	101.1	100.7	101.2	102.0	101.1	101.2
	19th group	101.9	102.1	102.5	99.1	99.7	100.4

**Table C8 The impact on aggregate welfare**

Unit of measure	Region	Fixed wages			Flexible wages		
		<i>Standard</i>	<i>Low</i>	<i>High</i>	<i>Standard</i>	<i>Low</i>	<i>High</i>
Billions of 1990 TL	Turkey	2750.3	1405.5	8433.3	1226.3	75.4	4123.5
	Urban	2759.3	2282.5	8548.6	-2135.2	-2433.2	2487.6
	Rural	-9.1	-877.0	-115.3	3361.4	2508.6	1635.9
% of household income	Turkey	100.8	100.4	102.6	100.4	100.0	101.3
	Urban	101.4	101.1	104.2	99.1	98.9	101.3
	Rural	100.0	99.3	100.0	102.5	101.9	101.2

**Table C9 The impact on the size distribution of income (Base year = 100)**

Generalised Entropy Index	Inequality	Fixed wages			Flexible wages		
		<i>Standard</i>	<i>Low</i>	<i>High</i>	<i>Standard</i>	<i>Low</i>	<i>High</i>
- 1	Overall inequality	100.5	101.3	101.5	98.0	98.4	99.8
	Within urban group	99.9	100.8	100.8	98.2	98.7	99.8
	Within rural group	99.7	100.2	98.1	100.7	100.7	99.7
	Between groups	107.5	109.8	123.8	82.3	84.5	100.1
0	Overall inequality	100.7	101.4	101.8	98.2	98.6	100.0
	Within urban group	100.3	100.9	101.0	98.8	99.1	100.1
	Within rural group	100.1	100.6	99.0	100.4	100.4	99.8
	Between groups	107.4	109.7	123.3	82.5	84.7	100.1
+ 1	Overall inequality	101.5	102.1	103.1	98.2	98.4	100.3
	Within urban group	101.0	101.5	101.7	99.5	99.5	100.5
	Within rural group	100.7	101.2	100.1	99.9	100.0	99.9
	Between groups	106.5	107.9	115.3	89.7	91.5	100.6
+ 2	Overall inequality	103.6	104.4	106.4	97.8	97.7	101.0
	Within urban group	102.7	103.2	103.5	100.4	99.0	101.2
	Within rural group	101.7	102.5	101.7	98.8	99.0	99.7
	Between groups	107.3	109.6	123.0	82.7	84.9	100.1

**Table C10 The impact on the functional distribution of income**  
(Base year = 100)

	Fixed wages			Flexible wages		
	<i>Standard</i>	<i>Low</i>	<i>High</i>	<i>Standard</i>	<i>Low</i>	<i>High</i>
<b>A -Capital income</b>	<b>100.7</b>	<b>101.0</b>	<b>101.2</b>	<b>99.1</b>	<b>99.6</b>	<b>100.2</b>
- Agricultural income	97.2	96.8	94.0	103.7	102.4	99.6
- Non-agricultural income	101.5	101.9	102.8	98.1	99.0	100.3
<b>B - Labour income</b>	<b>100.4</b>	<b>99.0</b>	<b>102.3</b>	<b>99.9</b>	<b>99.2</b>	<b>100.0</b>
<b>B.1 - Skilled labour income</b>	<b>100.6</b>	<b>100.2</b>	<b>102.1</b>	<b>98.2</b>	<b>96.5</b>	<b>99.6</b>
- Professional workers	100.3	100.0	101.5	97.9	95.8	99.4
- Managerial workers	101.5	100.7	103.4	99.0	97.9	100.1
- Clerical workers	100.6	100.3	102.5	98.2	96.8	99.6
<b>B.2 - Basic skilled labour income</b>	<b>101.8</b>	<b>101.0</b>	<b>104.7</b>	<b>99.5</b>	<b>98.8</b>	<b>100.2</b>
- Sales workers	101.2	101.7	106.2	98.5	96.7	99.2
- Service workers	100.2	100.0	102.8	99.0	97.6	99.6
- Non agricultural workers	102.4	101.2	105.2	99.7	99.6	100.6
- Other workers	102.1	101.1	104.4	99.4	98.6	100.3
<b>B.3 - No-skilled labour income</b>	<b>97.4</b>	<b>93.2</b>	<b>97.8</b>	<b>103.2</b>	<b>104.2</b>	<b>100.0</b>
- Agricultural workers	97.4	93.2	97.8	103.2	104.2	100.0
<i>Basic skilled / Skilled labour income</i>	<i>101.2</i>	<i>100.8</i>	<i>102.6</i>	<i>101.3</i>	<i>102.5</i>	<i>100.7</i>
<i>No-skilled / Skilled labour income</i>	<i>96.8</i>	<i>93.0</i>	<i>95.7</i>	<i>105.2</i>	<i>108.0</i>	<i>100.4</i>
<i>Basic skilled labour / Capital income</i>	<i>101.1</i>	<i>100.0</i>	<i>103.4</i>	<i>100.4</i>	<i>99.2</i>	<i>100.1</i>
<i>No-skilled labour / Capital income</i>	<i>96.7</i>	<i>92.3</i>	<i>96.6</i>	<i>104.2</i>	<i>104.6</i>	<i>99.8</i>

**Table C11 The impact on employment**

	Relative change (Base year = 100)			Number of new workers			Share		
	<i>Standard</i>	<i>Low</i>	<i>High</i>	<i>Standard</i>	<i>Low</i>	<i>High</i>	<i>Standard</i>	<i>Low</i>	<i>High</i>
Labour Input	101.0	100.5	102.8	147505	86117	431658	1.000	1.000	1.000
- Professional workers	100.3	100.0	101.5	2827	- 242	15836	0.019	- 0.003	0.037
- Managerial workers	101.5	100.7	103.4	4901	2168	10901	0.033	0.025	0.025
- Clerical workers	100.6	100.3	102.5	5255	2373	21726	0.036	0.028	0.050
- Sales workers	101.2	101.7	106.2	18606	25232	94017	0.126	0.293	0.218
- Service workers	100.2	100.0	102.8	3050	595	41334	0.021	0.007	0.096
- Agricultural workers	100.0	100.0	100.0	0	0	0	0.000	0.000	0.000
- Non agricultural workers	102.4	101.2	105.2	110251	54617	242397	0.747	0.634	0.562
- Other workers	102.1	101.1	104.4	2615	1376	5445	0.018	0.016	0.013