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REGIONAL PLANNING IN TURKEY
EASTERN ANATOLIAN PROJECT
2000 – 2020

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Abstract

In the fall of 1999 we were asked to construct IO tables for three sub-regions in East Anatolia (EA). With a set of limited direct data and some secondary data we have constructed an independent IO table for each sub- region, namely Malatya, Erzurum, and Van. The planning model presented in this paper is a consistency model based on regional IO tables. However since it was impossible to combine these IO tables to obtain one and estimate the final demand vector, an *ad hoc* method is followed to estimate the future values of output, employment and investment. That is we could not apply the IO production model to estimate the future values that require the use of Leontief inverse and the final demand vector for the target year. Here we argue that in order to narrow the gap between EA and the other parts of Turkey in terms of development indices per capita income in EA should grow at least 6.5% per annum over the next 20 years. Meanvhile the share of agriculture must be reduced to restructure the economy in favour of industry and services.

The paper is organized in six sections. In the first section regions are introduced with some development indicators. The second part explains the economic structure and growth performance of the EA region for the last 10 years. The third part describes a set of three growth scenarios formulated for the region. The fourth part introduces an investment model used to estimate total investment requirement over the planning period 2001 – 2020. In section five, employment estimates are provided for the region. Finally, section six is devoted to summary and conclusions.

Key words: Eastern Anatolian Project in Turkey. Regional development. Multisector growth model.

1. Introduction

There are seven regions in Turkey identified mainly with differences in climatic conditions. This paper is an attempt to build a multisectoral growth model for the region of East Anatolia covering 16 provinces. Total number of population in the eastern part of Turkey is about 6 million in 2000. Although development planning has a long history in Turkey regional planning has not been one of the main practices for a long time. Until recently regional planning activity has been confined only to South East Anatolia (GAP with Turkish initials). In addition to GAP Eight-Five-Year Development Plan covering 2001 – 2005 identifies some new priority regions. These are DOKAP (East Black Sea Region), Zonguldak-Bartin, DAP (East Anatolia). East Mediterranean, and Marmara regions. State Planning Organization formed a research team from the Universities in East Anatolia. We were the members of the planning group from Ankara assigned to design development scenarios for the region.

Regional disparities in Turkey are identified with a composite social and economic development index calculated by the State Planning Organization.(SPO). In 1996 these regions are ranked as in Table 1 below.

Table 1. Regions Ranked by Socio-economic Development Index (1996)

	Region	Development index	Per capita income index
1	Marmara	1,69	156
2	Aegean	0,50	125
3	Central Anatolia	0,46	91
4	Mediterranean	0,06	95
5	Black Sea	-0,54	68
6	Southeast Anatolia	-1,03	56
7	East Anatolia	-1,13	41
	Turkey		**100**

Source: SPO (2000a);SIS (2001b).

It is obvious that there is a positive and strong correlation between the social and economic development index and per capita income index. The map below shows seven geographic regions of Turkey. In recent years national income statistics are published at the level of provinces and thus regions. In terms of per capita income Turkey's national average was $2967 in 2000 and it dropped to $2160 as the economy experienced a deep recession by -8.5% in 2001. The fall in per capita income was 27.2% in dollar terms due to an enormous appreciation of dollar against Turkish lira.

East Anatolian region is the poorest part of Turkey among seven regions Per capita income is only 45% of the national average. This has not been changed much over the last 40 years of planning. It appears that national development planning process has not helped much to reduce the income differential between regions. Therefore there is an urgent need to formulate a regional development plan for EA. To meet this end the State Planning Organization asked the universities in the region to formulate a project to address the main issues of the region and identify possible growth areas i.e. sectors of priorities. We were

invited to construct IO tables for the region and build a model for future growth that can alleviate poverty.

We constructed three different IO tables for three sub-regions of EA designated by the other members of the research group. The research group was formed mainly from the members of the five universities established in the region. We contributed to the main project with three IO tables one for each sub-region as well as three growth scenarios for each region. This paper is a revised and updated version of our contribution to the above-mentioned project.

2. Eastern Anatolia: The Size and the Structure of the Economy

2.1 The Size of the Economy

As for the census of population 2000 the total population in EA covering 16 provinces is only 6 million. That is 8.8% of Turkey's total population of 68 million. Total regional area is 156 thousand square kilometers. That is one fifth (20%) of the Turkey's total surface area of 775 thousand square kilometers. Population density in the region is only 41 per square kilometer in 2000 while it is 68 for the whole country. However total regional income is $8 billion and this is only 4% of total national income that is about $200 billion (Table 2).

Table 2 also shows that the share of rural population is one of the highest in East Anatolia. That is 50% of population lives in rural districts covering villages and smaller small communities with less than 2000 inhabitants.

Looking at Table 2 one can postulate that there is an inverse relation between per capita income and the share of the rural population in total population across the regions. I would like to add this hypothesis to the one proposed by Olson (1996). Olson argues that there is a positive and statistically significant correlation between the population density and

per capita income across countries. To test this hypothesis we estimated a simple linear regression model for 126 countries including outliers (World Bank, 2001). The result is given by the following equation:

$$PCI = 4753{,}1 + \underset{(2{,}521)}{3{,}35}DEN, \qquad R^2 = 0{,}05 \qquad r = 0{,}22 \qquad 1$$

Where
PCI : Per capita income in US dollars
DEN: Population density (persons per square kilometer)
R^2: Coefficient of determination
r: Correlation coefficient
Note: t-statistic for the regression coefficient is shown in parenthesis. It is significant at 1 percent level for one-tailed test.

The estimated model shows that an additional one person per square kilometer adds more than three dollars to per capita income.

Table 2. Regional Income and Population 2000

Region	GDP 1000 trillion TL	% of total	GDP billion $	per capita income $	Index	Pop million	% of total	Rural pop	Rural pop % of total
Mediterranean	15	12,1	24	2761	93,9	9	13,2	4	44,4
East Anatolia	5	4,0	8	1343	45,7	6	8,8	3	50,0
Aegean	19	15,3	30	3403	115,7	8	11,8	4	50,0
SE Anatolia	6	4,8	10	1532	52,1	7	10,3	3	42,9
Central Anatolia	21	16,9	33	2909	98,9	12	17,6	4	33,3
Black Sea	12	9,7	19	2225	75,7	8	11,8	4	50,0
Marmara	46	37,1	73	4270	145,2	18	26,5	4	22,2
Total (Turkey)	**125**	**100,0**	**199**	**2941**	**100,0**	**68**	**100,0**	**24**	**38,2**

Source: (SIS, 2001b)

In comparative studies calculations relating to the structure of an economy either regional or national must be based on the current values of relevant variables. To use the constant price values for this purpose can be misleading and simply wrong. The reason is twofold. On the one hand there is only one structure based on current price values but there are infinitely many numbers of constant price values. On the other hand one cannot appreciate the latest or current state of the economy at a set of prices, which were relevant only in the past. It should be noted that in many studies and reports about the Turkish economy this point is undermined. Researchers and experts waste their time to calculate constant price values just for structural analysis. Clayton and Giesbrecht (1992) also support this point of view.

2.2 The Structure of the Economy

The shares of production sectors in GDP measure the structure of an economy. Table 3 shows a 14-sector structure of EAR (Estern Anatolian Region) in comparison with Turkey in 2000.

Table 3. Economic Structure and Growth in EAR (2000)

			%	Average annual % growth 1987 -1997	
Sector	TR	EA	EA/TR	TR	EA
Agriculture	**14,0**	**27,9**	**8,2**	**1,6**	**0,6**
1 Agriculture & an. husb.	13,3	27,3	8,5	1,8	0,7
2 Forestry	0,3	0,3	3,2	-1,1	-3,4
3 Fishery	0,4	0,3	2,1	1,3	5,1
Industry	**24,3**	**11,4**	**1,9**	**5,6**	**3,4**
4 Mining & quarrying	1,1	0,4	1,4	-1,1	6,0
5 Manufacturing	20,2	8,3	1,7	5,7	4,4
6 Electricity, gas, water	3,0	2,7	3,8	8,2	0,6
Services	**61,7**	**60,7**	**4,1**	**4,1**	**2,2**
7 Construction	5,2	5,2	4,0	1,7	-2,0
8 Wholesale & ret. trade	16,7	10,0	2,5	5,2	4,2
9 Hotels, restaurants. Etc.	3,5	1,3	1,6	7,5	5,0
10 Transp. & commun.	14,2	11,6	3,4	5,1	3,0
11 Financial inst.	3,8	1,5	1,6	1,0	-1,4
12 Self-employed & oth. ser.	3,6	1,1	1,3	3,7	1,3
13 Government services	10,1	27,1	11,1	1,7	1,2
14 Dwellings	4,6	2,9	2,6	2,2	1,7
GDP	**100,0**	**100,0**	**4,1**	**4,1**	**2,0**
Population (Million)	68	6	8,8	1,3	0,5

Source: SIS (2001b).

Basic characteristics of the structure of the economy of EAR can be identified as follows.

i. The share of Agriculture is quite high as compared with national average. It is approximately 28% in EAR in 2000 while is 14% in Turkey.

ii. The share of Industry is relatively small that is only 11,4% while it is 24,3% in Turkey.

iii. Services are of almost the same size as it is in Turkey. Its share in regional GDP is about 61% while it is 62% in Turkey.

iv. As far as Services are concerned the size of government services is twice the corresponding size in the Turkish economy as a whole. That is its share in regional economy is about 27% while it has only 10% in country's GDP. This reflects the fact that in eastern part of Turkey the economy mostly depends on government wages paid mainly to the civil servants along with military personnel and employees.

2.3 Growth of the Economy

In terms of growth performance over the last ten years from 1987 to 1997 EA lacks behind the national average. Here again one can postulate that as the share of industry and services in GDP increases both the level and the rate of increase in per capita income goes up. To put it other way round higher the size of agriculture in an economy is lower the level of per capita income. In addition the rate of increase in per capita income slows as the region gets poorer. The last two columns in Table 3 show that the annual average growth rate in EA was only 2 percent while it was 4,1 percent for the whole economy. In all sectors, except for mining and quarrying, the growth rates in Turkey exceeded the corresponding growth rates in the region. In particular even in the agricultural sector average growth rate in EAR was below the national rate. This is simply a contradiction to the common belief that Eastern Anatolia has a comparative advantage in agriculture particularly in the branch of husbandry.

Lucas (1985) supports the foregoing argument for international comparisons. Lucas points out that the poorest countries grew least while middle-income countries grew highest, and the high-income countries grew in between

3. Growth Alternatives for EA Region

3.1 Static IO Production Model

In a consistency planning framework the static IO production model can be used to predict the future values of output in each sector by the following equation

$$t = (I - A)^{-1} f \qquad 2$$

Where
t = Vector of output
I = Identity matrix
A = Matrix of local (domestic) input coefficients
f = Vector of final demand

For the whole project a separate IO table was constructed for every sub-region of EA. Regional IO tables are based on national IO tables together with a set of secondary data at regional level (SIS, 2001a, 2001b). The last two IO tables for the national economy belong to 1990 and 1996 (SIS, 2001c, 1994). But the last one, i.e., the IO 1996, was not published yet so that we made use of only the 1990 IO table as a reference.

However, due to lack of statistics and bridge matrices we could not use the static IO model to estimate the vector f and therefore t. Instead a manual balancing process is applied as explained below.

Three alternative growth scenarios (or runs), denoted by A1, A2, and A3 are formulated to reach three different targets over the planning period 2001 - 2020. In each case two conditions are observed simultaneously. First one is to increase per capita income in EAR to a certain proportion of national average. That is per capita income was the target variable of the growth process. The second one is that as economy grows over a predetermined path the structure of the regional economy is forced to converge to the structure of the national economy attained in 1997. Each run is described with its particular assumptions and solution procedure below. Finally the reference year was 1997 and the base year was 2000. That is all calculations are expressed in 1997 prices while growth rates based on the values of the variables realized in 2000.

3.2 Low Growth Scenario: A1 Run (g = 5,2%)

The first growth scenario called A1 aims at bringing per capita income in the greater EA region to 57,1% of the national average, which were $3079 in 1997 and $2160 in 2001. In A1 run per capita income in EA region will grow at 5,2% per annum from 2001 to 2020. Table 4 shows past and future growth path for the regional per capita income in comparison with corresponding national figures. Here the national figures are derived from the eight-five year development plan (2001 – 2005) published by the State Planning Organization.

Table 4. Low Growth Scenerion: A1 Run (g = 5,2%).

	EA		TR		
Year	Per capita income	Annual average % growth	Per capita income	Annual average % growth	EA/TR %
1985	173	1,1	322	1,1	53,7
1990	187	1,6	364	2,5	51,4
1995	196	0,9	410	2,4	47,8
2000	213	1,7	476	3,0	44,7
2005	240	2,4	505	1,2	47,5
2010	314	5,4	628	4,4	50,0
2015	435	6,5	814	5,2	53,4
2020	597	6,3	1045	5,0	57,1

To convert the TL values for per capita income into dollar one can apply the exchange rate in 1997 which was $1 = TL151,42852. For example in 2020 per capita income in Turkey in 1997 dollars will be $6473 (=1045/0,15142852). In all tables g stands for the average annual percentage growth rate of regional GDP.

3.3 High Growth Scenario: A2 Run (g = 6,5%)

In A2 run per capita income in EAR was targeted to reach 74.4% of national average. In this run per capita income in EA will grow at 6,5% per annum over the planning period, which is 1,3 percentage points higher than the low growth scenario. The growth path of this run is given in Table 5 below.

Table 5. High Growth Scenario: A2 Run (g = 6,5%)

	EA		TR		
Year	Per capita income	Annual average % growth	Per capita income	Annual average % growth	EA/TR %
1985	173	1,1	322	1,1	53,7
1990	187	1,6	364	2,5	51,4
1995	196	0,9	410	2,4	47,8
2000	213	1,7	476	3,0	44,7
2005	260	4,0	505	1,2	51,5
2010	366	6,8	628	4,4	58,3
2015	536	7,6	814	5,2	65,8
2020	777	7,4	1045	5,0	74,4

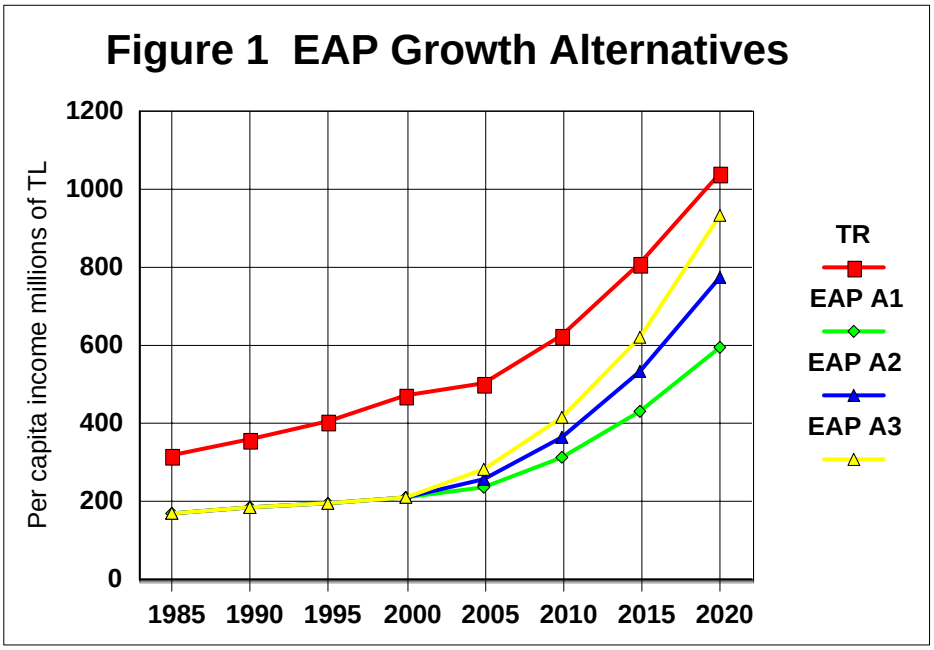
3.4 Higher Growth Scenario: A3 Run (g = 7,4%)

Finally in the highest growth version of runs named A3 per capita income is targeted to reach 89,4% of Turkey's average. In this run per capita income in EA will grow at 7,4% per annum over the next 20 years. The growth path of this run is given in Table 6 below.

Table 6. Higher Growth Scenario: A3 Run (g = 7,4%)

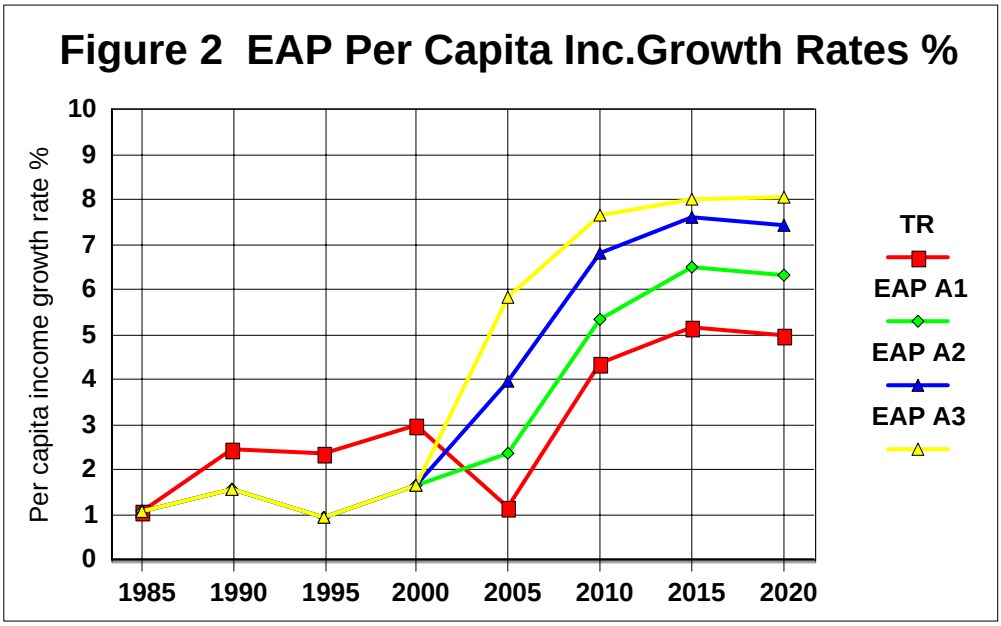
	EA		TR		
Year	Per capita income	Annual average % growth	Per capita income	Annual average % growth	EA/TR %
1985	173	1,1	322	1,1	53,7
1990	187	1,6	364	2,5	51,4
1995	196	0,9	410	2,4	47,8
2000	213	1,7	476	3,0	44,7
2005	285	5,8	505	1,2	56,4
2010	418	7,7	628	4,4	66,6
2015	624	8,0	814	5,2	76,7
2020	934	8,1	1045	5,0	89,4

A brief statement of the three runs described above is this. In the first case annual average increase in regional per capita income over the planning horizon will be 5,2%, while it will be 6.5% and 7.4% in the second and third alternatives respectively. The graph of these three runs is given in Figure 1 and 2 below together with the corresponding national average figures.



In Figure 1 the top line shows the past and planned future growth path of per capita income in Turkey. This path has already shown a big fall for the first five years of the 21st century. The reason for this is the fact that the Turkish economy grew -8,5% in 2001.

Figure 2 shows the growth rates in per capita income for three runs together with the past and future values of the corresponding national average



Again as it is seen from Figure 2 the fall in per capita income in Turkey between 2000 and 2005 is dramatically high. In fact in 2001 the per capita income in dollar terms fell by 27,2%

It is also readily seen from both Figure 1 and 2 that for the first case, i.e. for A1 run the growth rate is not sufficient to catch up with the national average and the third case i.e. A3 run is almost infeasible. Therefore a reasonable growth path would be the second alternative, that is A2. Therefore this run is analyzed further in the following section.

3.5 A2 Run Reexamined: (g = 6,5% in detail)

The model predictions presented here are based on the second run, i.e. A2 alternative. For this run the targeted regional income (GDP) will be $36690 million in 2020 and the annual growth rate will be 7,3% while cumulative growth rate for 20 years will be 434,8%. The amount of cumulative investment for this plan is estimated to be $92481 million in order to reach all the targets. (See Section 4 below). Table 7 shows GDP in 14 sectors.

Table 7. GDP with A2 Run (Million $)

Sector	1997	2000	2005	2010	2020
Agriculture	**1905**	**2034**	**2489**	**3337**	**5911**
1 Agriculture & an. husb.	1833	1957	2373	3115	5338
2 Forestry	36	38	56	107	303
3 Fishery	36	39	60	115	270
Industry	**1152**	**1238**	**1881**	**3244**	**8850**
4 Mining & quarrying	159	172	258	457	1211
5 Manufacturing	721	770	1192	2097	6023
6 Electricity, gas, water	272	296	431	689	1617
Services	**4881**	**5166**	**6842**	**10155**	**21928**
7 Construction	475	513	760	1229	2758
8 Wholesale & ret. trade	825	880	1279	2184	5911
9 Hotels, restaurants. etc.	110	119	192	365	1084
10 Transp. & commun.	913	992	1422	2292	5222
11 Financial inst.	179	181	295	481	1272
12 Self-employed & oth. ser.	93	101	150	243	604
13 Government services	2127	2208	2512	3027	4352
14 Dwellings	159	172	231	333	725
GDP	**7938**	**8438**	**11212**	**16736**	**36690**

In order to reduce the income differential between the national average and East Anatolia and to secure a sustainable growth the economic structure of EAR should be altered in favor of Industry an Services. To envisage such a growth path a simple multi-sector economic planning model for the next 20 years (2001 - 2020) is constructed and solved. Model solution is performed by manual manipulations of the figures once the target level and structure of regional GDP are fixed. Over the planning horizon the economy of the region would grow at about 7,3% per annum. Growth rates are given in Table 8.

The structure of the regional economy will be transformed to the one close to the structure of economy of Turkey in 1997. As a result the share of Agriculture in GDP in EAR will drop from 24% in 1997 to 16% in 2020 Similarly the share of Industry will go up from 15% to 24%. And the share of Services will stay almost constant. Practically it will go down from 62% to 60%. The reason for this slight decline in the share of Services in general is the big drop in the share of government services in the region.

Table 8 EAR GDP Structure and Growth in A2 Scenario (%)

Sector	Annual average % growth 87-97	100-120	Cumulative % growth 100-120	Structure (% of GDP) EA 1997	EA 2020	TR 1997
Agriculture	**3,4**	**5,3**	**290,6**	**23,9**	**16,1**	**13,5**
1 Agriculture & an husb.	3,6	5,0	272,7	23,1	14,5	12,7
2 Forestry	-4,1	10,4	798,5	0,4	0,8	0,4
3 Fishery	6,9	9,7	692,3	0,4	0,7	0,4
Industry	**5,1**	**9,8**	**714,9**	**14,5**	**24,1**	**24,5**
4 Mining & quarrying	0,0	9,8	703,8	2,0	3,3	1,4
5 Manufacturing	4,4	10,3	782,2	9,1	16,4	20,5
6 Electricity, gas, water	9,2	8,5	546,2	3,4	4,4	2,6
Services	**1,9**	**7,2**	**424,5**	**61,6**	**59,8**	**62,0**
7 Construction	-2,6	8,4	537,6	6,1	7,5	5,3
8 Wholesale & ret. trade	4,5	9,5	671,7	10,4	16,1	17,0
9 Hotels, restaurants. etc.	3,7	11,0	910,8	1,4	3,0	4,8
10 Transp. & commun.	2,8	8,3	526,5	11,5	14,2	14,1
11 Financial inst.	-2,5	9,7	702,8	2,2	3,5	5,5
12 Self-employed & oth. ser.	4,7	8,9	597,9	1,2	1,6	3,5
13 Government services	1,9	3,4	197,1	26,8	11,9	8,9
14 Dwellings	0,8	7,2	421,7	2,0	2,0	2,9
GDP	**2,6**	**7,3**	**434,8**	**100,0**	**100,0**	**100,0**

4. Investment Model

4.1 The Model

Investment is the second major variable beside the employment in determining the rate of economic growth. However it is rather difficult to identify a common practice in calculating the size of the annual investment for a development project or plan. In Turkish planning experience the most favored method is based on the concept of ICOR (incremental capital-output ratio). This type of accelerator model is attributed to Harrod and Hicks (Heesterman, 1971). But Brown (1991) points out that the story of accelerator model dates back as far as the 1910s starting with the work of Clark (1917). A new version of this model, suggested by Startz (1994), is introduced below and applied in estimating the annual investment flows for the whole planning period.

In this version of accelerator model of investment the change in total gross investment is related to the change in income as follows:

$$dI = \beta_0 + \beta_1 dY + u \qquad 3$$

dI: Change in real investment, i.e. $dI = I_t - I_{t-1}$,
dY: Change in real GDP $dY = GDP_t - GDP_{t-1}$,

β_0, β_1 : Regression coefficients

u: Error term

The estimated form of the investment function for the Turkish economy over the period 1980 – 1997 is given below

$$dI = -0{,}03 + 0{,}52dY \qquad R^2 = 0{,}80 \quad n = 18,\ df = 16 \qquad 4$$
$$(7{,}94)$$

This model is applied under the condition that the ratio of investment to income must be between 18% and 26%.

$$0{,}18 \leq \frac{I}{Y} \leq 0.26 \qquad 5$$

This constraint is implied by the historical reason: Over the last forty years the share of investment in GDP has never been exceeded 26% for the national economy. The lower limit for this ratio was 18%. It must be reminded that the share of GDP devoted to investment is at least 30 percent for most of the newly emerging countries in East Asia.

4.2 Projections

Investment projections for 14 sectors are given at three intervals in Table 9.This is done only for the A2 run since it is the most favored alternative. Regional investment will reach $13 billion for the first five years of planning period, $21 billion for the second five-year period, and for the last ten years it will be $58 billion. Thus total or cumulative investment plan for the next 20 years will be $92 billion. Annual average growth rate for the investment plan will be 9,8%. The main deficiency of investment plan is that it does not provide a breakdown of investment for each sector of the economy. That requires a separate investment function for each industry.

Table 9 EAR Total Investment Plan with A2 Scenario (Millions of dollars)

Sector	100-105	106-110	111-120	Cumul. 101 - 120	Annual av. % growth
Agriculture	**1579**	**2381**	**6165**	**10125**	**9,1**
1 Agriculture & an husb.	1288	1852	4527	7667	8,4
2 Forestry	185	304	839	1328	10,1
3 Fishery	106	225	799	1130	13,5
Industry	**1911**	**3948**	**13736**	**19595**	**13,1**
4 Mining & quarrying	199	409	1498	2106	13,5
5 Manufacturing	1017	2311	7975	11303	13,7
6 Electricity, gas, water	695	1228	4263	6186	12,1
Services	**9862**	**14713**	**38186**	**62761**	**9,0**
7 Construction	3456	4758	11298	19512	7,9
8 Wholesale & ret. trade	1400	2271	6541	10212	10,3
9 Hotels, restaurants. etc.	780	1328	3625	5733	10,2
10 Transp. & commun.	2507	3675	9495	15677	8,9
11 Financial inst.	252	502	1689	2443	12,7
12 Self-employed & oth. ser.	542	984	3094	4620	11,6
13 Government services	786	977	1922	3685	6,0
14 Dwellings	139	218	522	879	8,8
Total	**13352**	**21042**	**58087**	**92481**	**9,8**

5. Employment Model

5.1 The Model

Employment plan is another area of difficulty for the regional planning, There are a couple of reasons for this assertion. Firstly population estimates and projections are not based on careful calculations by the State Institute of Statistics. For example there are three population count or census for the last ten years: 1990, 1997, and 2000. For these three years total population for the region is estimated to be 5624, 5869, and 6422 thousand respectively. Accordingly, from 1990 to 1997 population growth rate was only 0,6 percent per year, while it was 3 percent per year for the last three years, from 1997 to 2000 (SIS, 2000; 2001). These two rates are clearly inconsistent. So is the total population in Turkey: it was 56,5 million in 1990, 62,9 million in 1997, and 77,5 million in 2000. So the annual percentage increase for the first seven years (from 1990 to 1997) was 1,5 and for the last three years (from 1997 to 2000) was 2,5. It is hard to explain why the rate of increase in population is accelerated that much both in EA and in Turkey.

Secondly, there is no employment series for the EAR whatsoever. The only available data is a table for each province named "Population by the branches of economic activities" which dates back to 1990. These data include all people at the age of 12 or higher. Therefore it includes all people both employed and unemployed or those out of labor force. A report containing some evaluation for the whole region estimated that in 1997 the level of employment is 2,2 million. From this rudimentary calculations one can figure out that the

ratio of employment to total population in the region is 37,3 percent. The same ratio for the national economy is 34,6 percent.

To make a reasonable comparison it can be added that the same ratio for the UK economy is about 46 percent. Although there are important structural differences concerning the labor market in two countries there is a lesson to be taken from this comparison. When there is a convergence of the structure of a less developed country to that of a developed one, this tendency would also be observed in the labor market structure.

The reason why we are interested with the labor market is that any growth model however simple should include employment variable at some point. Consider the following neoclassical growth model

$$Y = AF(K, L) \qquad 6$$

where

Y: Production
A: Productivity
F: Abbreviation for function
K: Capital
L: Labor

It is assumed that both partial derivatives are positive, i.e.

$$\frac{\delta Y}{\delta K} > 0 \text{ and } \frac{\delta Y}{\delta L} > 0 \qquad 7$$

Therefore as the level of employment increases so does the level of output.

A specific form of the production function is called the Cobb-Douglas production function and is written as

$$Y = AK^{\alpha} L^{\beta} \qquad 8$$

where

α:: the share of capital in production as well as the elasticity of production with respect to capital.

β: the share of labor in production as well as the elasticity of production with respect to labor.

Dornbusch, Fischer, and Startz (2001) suggest that, tacitly attributed to Solow, the value of β for the US economy is approximately 0.75.

Since the role of labor is so important in any planning model we had to estimate the level of employment in the region. We based our estimate on the following assumptions.

i. As a result of increasing rate of urbanization, both the level and share of employment in the agricultural sector will decline while those in industry and services will increase.
ii. Employment in all sectors will increase as we move from a lower scenario to a higher one.
iii. As an empirical rule we assume that employment to population ratio will have a lower limit of 34 percent and an upper limit of 40 percent. That is

$$0{,}34 \leq \frac{L}{N} \leq 0{,}40 \qquad 9$$

where
N: Population
L: Number of people employed

iv. Labor productivity will increase in each sector. In particular increase in output in agricultural activities will be the result of increased labor productivity and investment in new capital. As a result, in this sector although the level of employment falls output will rise.

Thus to complete the model we estimated the employment figures for the 14 sectors consistent with the A2 run. Table 10 displays the results for four benchmark years.

It is assumed that over the planning period regional population shall grow at 1.2 percent per year. Assuming a high level of unemployment increase in the rate of employment will be somewhat higher than population growth rate at 1,5 percent. Accordingly regional population will reach to 8.2 million in 2020 and employment will be 2,9 million. Increase in total employment will be 769 thousand.

Depending on our initial assumptions the structure of employment will be altered. Accordingly the share of agriculture in total regional employment will have dropped from 70,1 percent in 1997 to 34,4 percent in 2020. The share of industry will go up from 4,4 percent to 15,7 percent. Finally services will occupy the highest share as it goes from 35.5 percent to approximately 50 percent.

Table 10. Employment Plan in EA for A2 Run (Thousands)

	Sector	1997	%	2000	2010	2020	%
	Agriculture	**1507**	**70,1**	**1398**	**1153**	**998**	**34,4**
1	Agriculture & an. husb.	1503	69,9	1388	1125	948	32,7
2	Forestry	2	0,1	5	17	29	1,0
3	Fishery	2	0,1	5	11	21	0,7
	Industry	**94**	**4,4**	**124**	**276**	**457**	**15,7**
4	Mining & quarrying	6	0,3	10	26	52	1,8
5	Manufacturing	81	3,8	100	219	348	12,0
6	Electricity, gas, water	7	0,3	14	31	57	2,0
	Services	**548**	**25,5**	**612**	**947**	**1448**	**49,9**
7	Construction	76	3,5	89	166	265	9,1
8	Wholesale & ret. trade	81	3,8	92	186	313	10,8
9	Hotels, restaurants, etc.	10	0,5	19	53	115	4,0
10	Transp. & commun.	50	2,3	62	128	239	8,2
11	Financial inst.	11	0,5	15	29	70	2,4
12	Self-employed & oth. ser.	15	0,7	18	34	71	2,4
13	Government services	300	14,0	309	332	346	11,9
14	Dwellings	5	0,2	8	19	29	1,0
	Total (L)	**2149**	**100,0**	**2134**	**2376**	**2903**	**100,0**
	Population (N)	5869		6422	6646	8191	
	L/N (%)	36,6		33,2	35,8	35,4	

6. Conclusions

In this paper the economy of the region covering three big provinces, namely Malatya, Erzurum, Van and some 13 other neighboring provinces called Eastern Anatolia (EA) is analyzed. Per capita income in the region as of 2000 is $1343, which is only 46% of the national average of $2941. The region is the least developed one among seven regions. The structure of the economy is dominated by the agricultural activities and 50% of the total regional population lives in rural area. This structure is the main reason for relatively low level of per capita income. Even worse the growth rate over the past 10 years has not been promising. GDP growth rate in the region has been only 2% between 1987 and 1997; while it was 4.1% in Turkey. This implies that the gap between the national average and the regional one has been widening.

In order to reduce the income differential with respect to national average and to secure a sustainable growth the economic structure of the region must be transformed in favor of Industry and Services. To envisage such a growth path a simple multi-sector economic planning model for the next 20 years (2001 - 2020) is constructed and solved manually. The targeted growth rate of the regional economy is assumed to be at least %7,3.

Total investment required to accomplish this task is estimated to be about $92 billion. An employment plan for the region is also estimated in a rudimentary way. According to the employment plan a total of 769 thousand new jobs will be created in the region. The only question remains to be answered for this project is how to finance such an ambitious regional

development plan. There are four possible sources of finance. These are regional savings (both private and public), private savings from the other regions, and funds from the central government. Fourth and most important one will be the regional fund from the European Union.

All calculations in this project are carried out in Lotus 123 spreadsheet program by hand with a couple of simple equations. We now understand that next and best step in our planning and modeling work must be based on Inforum-type interindustry models. Lack of data should not be an obstacle to apply such models.

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