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Economic impact assessment of alternative SEARCH policy options with the application of the GMR-Turkey model

Attila Varga, Mete Basar Baypinar

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Economic impact assessment of alternative SEARCH policy options with the application of the GMR-Turkey model

Attila Varga
Department of Economics and Regional Studies
and
MTA-PTE Innovation and Economic Growth Research Group
Faculty of Business and Economics
University of Pécs

and

Mete Basar Baypinar
Department of Urban and Regional Planning, Regional Planning Division, Faculty of Architecture, Istanbul Technical University
and
Department of Economics and Regional Studies
Faculty of Business and Economics
University of Pécs

Abstract
The SEARCH project targets the analysis of the impact of the European Neighborhood Policy (ENP) on the integration of EU neighboring countries with the EU. Several policy suggestions have arisen from SEARCH publications all of them offering promising ways of improving the ENP. This paper applies the GMR-Turkey policy impact model to estimate the likely effects of a selected set of suggested policies on the economies of European neighborhood countries (ENC). We grouped SEARCH policy suggestions into two alternative sets of measures, which became the bases of two alternative scenarios of regional economic development, the Conservative scenario and the Technology development scenario. Our results suggest that a persistent and systematic long term regional technology development-based economic policy which applies measures such as investment, education and R&D support, promotion of better connectedness to EU research networks and increased physical accessibility could in the longer run result in higher levels of regional and national production together with decreasing interregional differences than a scenario supporting the expansion of traditional industries in the region.

Keywords: Turkey, ENP, GMR-modeling, development policy, impact analysis R&D, human capital, innovation

JEL: O31, H41, O40

1. Introduction

The SEARCH project targets the analysis of the impact of the European Neighborhood Policy (ENP) on the integration of EU neighboring countries with the EU. The research has focused on four areas, such as trade flows, people mobility, human capital, technological activities, innovation diffusion and institutional environment. Several policy suggestions have arisen from SEARCH publications all of them offering promising ways of improving the ENP (SEARCH D6.3 2014). Some of them suggest policies aiming at intensifying trade flows with the EU for the advantage of all parties, some of them build arguments for better migration polices, while others refer to the option of improving the conditions of innovation via human capital development or R&D promotion in ENP regions.

In this report we apply an economic model to estimate the likely effects of a selected set of suggested policies on the economies of European neighborhood countries (ENC). Economic modeling has the advantage that it opens the possibility of ex ante simulating the likely impacts of different kinds of policies. Thus it provides a platform for the comparison of several policy options. The specific model construct chosen for analysis is the GMR (Geographic Macro and Regional) modeling approach that has been applied earlier for Cohesion policy and EU Framework Program impact analyses at the levels of European regions, the European Union and Hungary.

The particular country chosen for impact analysis is Turkey. This choice is motivated by practical reasons: availability and reliability of data for modeling. Though data collection for Turkey is not a process without difficulties the situation in this respect is relatively more advantageous there as compared to other ENP countries (with the exception of Israel which cannot be considered as a typical ENP country for other reasons). Turkey is an accession country but in several respects its economic, social and cultural features make this country reasonably comparable to many of the ENP countries. In an earlier report (SEARCH D6.2 2013) we provided a detailed description of the GMR-Turkey model.

In this study we grouped SEARCH policy suggestions into two alternative sets of measures, which became the bases of two alternative scenarios of regional economic development, namely the Conservative scenario and the Technology development scenario. In the simulations we run the two scenarios separately for a selected Turkish region to assess their likely impacts on regional GDP, national GDP and interregional inequalities in Turkey. These results then provide the basis of a comparison of the effectiveness of the sets of SEARCH policy options.

This report has the following structure. In the second section we introduce the selected policy suggestions and develop a classification of the suggestions. The third sections outlines the applied GMR policy modeling approach while the fourth section presents simulation results. A summary closes the paper.

2. SEARCH Policy Inferences for ENP Countries

The SEARCH Project has evaluated a wide range of policy issues and provided a large set of policy inferences for the ENP Countries, based on numerous studies on trade and FDI, mobility and migration policies and policies on remittances, technology and innovation policies, and last but not the least, institutional and social capital policies. Policy Inferences are summarized in SEARCH Deliverable D6.3 (SEARCH D6.3 2014). This large set of policy inferences can be evaluated in two distinct and contrasting policy groups, one focusing more on a conservative (or traditional) approach to regional development in the ENP countries, while the other being a comprehensive technology- and innovation-based regional development approach. As such, interrelated policy inferences can also be better modeled and simulated to evaluate potential impacts of contrasting policy approaches on an ENP Country, in a precise and theoretically well-connected manner.

2.1 The conservative development approach

A more conservative development approach focusing more on the specific endowments and limitations of the regions emerges based on policy inferences that focus more on the *existing patterns* of trade and FDI structures as well as migration and current labor markets in especially regions of least able ENC countries.

The trade patterns imply that the ENCs have an asymmetric trade relationship with core EU15, making it often their primary trade partner while the opposite is not true. Ongoing trade patterns and lack of general purpose technological capabilities create a kind of path-dependency that limits the regions of ENCs to diversify their industrial base and establish a more symmetrical trade relationship with the EU15. Low institutional development, lack of necessary resources such as human capital and supporting infrastructure, and associated uncertainties are other factors that discourage the ENC regions.

A policy inference (p.i. 1.2) under such circumstances is that the EU trade policies, incentives and supporting programs should focus *ENC trade access* much more with recent EU Accession Countries than with core EU 15 to maximize the potential of trade as a reform incentive. To do so, specific policies might be designed to promote trade flow parity as a whole in ENCs, by *opening sectors* that are open to international imports, to exports as well (p.i. 1.6).

Arguably, this could help in maximizing trade potentials and thus contribute to decreasing regional disparities, which, is a significant and increasing risk in the ENCs. Policy inference 1.11 claims that the EU and the ENP should assign an increased responsibility to implement and support actions that will reduce spatial disparities and asymmetries in the countries of the EU neighborhood. The EU should consider how best to calibrate its mix of conditionalities and trade concessions to address fairly the specific domestic and trade circumstances faced by its least able ENC trade partners (p.i. 1.1). The ENP and related program supports should not be promoted in general but should take account of the *specific assets* of key regions, such as the quality of local infrastructures, capabilities, and the quality of regional institutions.

Research has also shown that there are substantial and significant problems of mismatch in the *labor markets* of the EU Enlargement and EU Neighborhood countries. Part of policy inference 4.30 recommends that; a) older less skilled workers should be retrained, as well as workers of all skill levels, and b) secondary and vocational education systems should be reformed and measures to improve the labor market matching for women workers need to be introduced such as provision of publicly provided nursery and similar services especially in the emerging market countries (such as Turkey).

2.2 The technology and innovation based development approach

A more aggressive, and technology based competitiveness oriented policy approach can also be distinguished. This approach is in contrast with the previous since it focuses more on the *potentials* of ENC regions that have not yet been exploited; such that there is a good scope for institutional development, labor mobility, technology adoption as well as development of technological and innovation capabilities. Similar to the conservative approach, quality of local infrastructures, capabilities and regional institutions still play a role in this approach, but the focus is more on boldly increasing the technological capabilities of regions that would decrease the asymmetric trade relationship with the EU 15 while promoting a deeper and well integrated trade relationship between ENCs and the EU. This is of course a desirable outcome that is in line with the concept of Deep and Comprehensive Free Trade Agreements (DCFTA), and arguably, it could encourage the ENCs to progress in democratic and economic reforms aligned to the "Acquis".

This approach, on the other hand, includes a larger set of elements that range from mobility of skilled workers to improvements in the networking capabilities of ENP regions with the EU regions. The approach to international migration and remittances, in this strand of policy, is significantly different. The core difference is that the elements of this approach focus more on enabling faster diffusion of knowledge between EU and ENC regions, through different channels such as FDI, mobility of skilled workers as well as research networks. There are also sharp contrasts with the previous policy approach regarding the role of women in the economy, which is likely a much more important issue for an ENC country experiencing rapid urbanization than an urbanized EU country. Below is a more detailed discussion of the policy inferences that could be grouped under the technology and innovation based development policy approach.

One of the first inferences is that policy makers should consider increasing existing technical assistance and investment actions aimed at improving the quality of supporting institutions in the ENCs that create conditions for firm emergence and firm growth (p.i.1.5). *Technoparks and incubators* are such institutions. Policy inference 3.23 suggests that technoparks and incubators should be supported where necessary conditions for effectiveness already exist, in line with policy inference 1.12, that ENFI and related supports should be promoted only according to specific assets of key regions.

Studies suggest that internationalization of productive systems is an important factor in the diffusion of knowledge, along with cooperation in R&D. Such activities ease adoption of technology, thus, policy inference 3.5 suggest that EU-ENC policies

should support both *adoption* of external technologies and R&D *collaborations*, while policy inference 3.13 suggests supporting *research excellence* and international scientific networking in lagging regions in CEE and ENCs could support overall regional development. On the other hand, expanded trade policies are expected to contribute to patenting activity (p.i.3.27). Fostering particularly vertical networks is found to be beneficial and is advocated in policy inference 4.9, that vertical networks should be supported through the ENP. The success of programs supporting international research networks are found to be higher if regions possess embedded local networks that are globally connected (p.i.2.6).

Putting together policy interventions on incubating and networking, policy inference 3.9 point that in order to augment innovation capacities of ENC regions, connectivity between EU and ENC actors should base on the European Commission's "smart specialisation" strategy.

Another facilitator of technology diffusion is suggested as the EU-based *FDI* since it is found to generate more knowledge spillovers in local economies of ENCs. Policy inference 1.10 suggest that future productivity benefits and growth potentials through EU-based FDI should be taken into account, while policy inference 3.31, suggest that FDI policies that bring innovative firms to ENCs should be supported since they stimulate patenting and similar innovative practices.

However, the ENCs experience significant difficulties in a variety of issues that hamper such a technology based competitiveness scenario. One of the primary issues are *institutional* capacity constraints and intellectual property rights. Policy inferences 1.8 and 1.9 address these issues, and advocate that EU should support institutional development in the ENCs.

Furthermore, institutional barriers or underdeveloped conditions have also significant impacts on *mobility* of actors that play a key role in the diffusion of knowledge. Studies have found that certain technologies require cultural proximity, like the matured ICT sector. This makes it necessary that a certain level of sustained mobility is needed to ensure cultural (including language skills) proximity. Policy inference 3.1 addresses explicitly this issue, and suggests that the ENP should formulate necessary policies for a mutual understanding of cultures and languages and ensure a balanced mobility of students from academy and industries between the EU and ENCs.

Policy inference 3.3 suggests that ENP should also be designed to incorporate instruments and conditions for scientists and inventors to generate knowledge and enable *knowledge flows* between the EU and the ENCs. Policy inference 3.19 go further by suggesting that the EU should consider setting up *training courses* on innovation management and entrepreneurship within academic or innovation related institutions in NCs, making use of national funds and experts from both the EU and the NCs. Another policy inference (p.i.3.22) aims at securing long term institutional capabilities and suggest that the ENP should be directed at creating enabling conditions for training young researchers, and joint mobility programs between the EU and the ENCs.

In the case of Turkey, a study have found that EU policies for innovation although make up less than 2% of the total public support are effective in promoting firm-level

innovation. Policy inference 4.13 hence suggests that the EU should consider strengthening support mechanisms for *universities and firms*.

The role of *human capital* cannot be overlooked in the diffusion of external technologies and local generation of technology. Human capital, being a key element in a competitiveness-based scenario, should be supported. Surely the most important intervention to foster human capital endowments in a region is through education, as advocated by the policy inference 4.10 where the EU is encouraged to support NCs governments in their investments in human capital through education. Similarly, policy inference 3.14 suggest that the ENP should support actions that increase the endowments of well-educated labor force in the ENCs, as they are found to be having *even a stronger impact* on innovation than formal R&D activities.

However, in this strand of policy approach *mobility and migration* between the EU and the ENCs are also seen as a key element to increase human capital. As already mentioned above, policy inference 3.22 and 3.1 support mobility of young researchers as well as employees in industrial sectors. Policy inference 2.5 reminds that inventor mobility policies are successful for transfer of knowledge, especially if they are sustained over long periods of time. As such, polices should encourage highly skilled workers to participate in research networks, and foster weak ties to enable knowledge exchanges between the EU and the ENCs (p.i.2.2.).

Temporary migration is seen as yet another effective mechanism in enabling diffusion of knowledge but also in increasing skills endowments of the human capital stocks in a region. As such, high skilled labor flows between the EU and the ENCs should be facilitated by reducing institutional barriers (p.i.2.1.) and ensuring reintegration of migrants (p.i.2.11.). Another useful mechanism works through *remittances*. Remittances are found to positively influence education levels, particularly by increasing years of schooling in the remittance receiving region. This could in turn help in increasing human capital in an ENC region otherwise lacking necessary funds for education. Policy inference, 2.10 advocates reducing barriers to remittances would increase their effective use. Furthermore, dual citizenships and temporary migration opportunities could help increase in the remittance flows, leading to higher schooling rates and a subsequent increase in human capital.

An important difference with the conservative scenario and the technology and innovation based scenario is that they have different gender approaches as well. While the former advocates support of jobs such as nursery, day caring, etc. to women, policy inference 4.8 addresses that innovation adoption in ENCs is affected by gender differences, and thus ENP should take into consideration the more conservative attitudes to innovation of women. Put together with policy inference 4.11 that addresses investments in social inclusion and inclusive growth would lead to build trust in society the technology and innovation based policy approach would promote a different development opportunity which is more in line with the Social Inclusion policies in the EU.

2. GMR-Turkey: A general overview

2.1 Policy instruments in GMR-Turkey

The GMR (Geographic Macro and Regional) framework is developed and extended in order to test as many as possible policy suggestions generated in earlier work packages of SEARCH. However, not every policy suggestions can be implemented in an economic impact model. Suggestions related to institutions are among them. This explains our choice to focus on prescriptions arising from WPs 2, 3 and 4.

Instruments implemented in the GMR-Turkey model (SEARCH D6.2 2013) reflect SEARCH policy suggestions and are categorized into the following classes:

1. General *macroeconomic* (space-neutral) policy instruments (such as policies promoting increasing trade with EU countries, incentives for more intense FDI activity, policies supporting temporary migration, specific government tax and expenditure regulations to foster research activities and innovation collaborations).

2. *Regional/local* (place-based) interventions (such as investment support of SMEs, research subsidies, promotion of more intense local knowledge flows and international scientific networking, physical infrastructure construction, promotion of human capital development by supporting education, place-specific incentives for attracting FDI).

2.2 General features of GMR models

The geographic macro and regional modeling (GMR) framework has been established and continuously improved to better support development policy decisions by ex-ante and ex-post scenario analyses. Policy instruments including R&D subsidies, human capital development, entrepreneurship policies or instruments promoting more intensive public-private collaborations in innovation are in the focus of the GMR-approach.

Models frequently applied in development policy analysis are neither geographic nor regional. They either follow the tradition of macroeconometric modeling (like the HERMIN model - ESRI 2002), the tradition of macro CGE modeling (like the ECOMOD model – Bayar 2007) or the most recently developed DSGE approach (QUEST III - Ratto, Roeger and Veld 2009). They also bear the common attribute of national level spatial aggregation. The novel feature of the GMR-approach is that it incorporates geographic effects (e.g., agglomeration, interregional trade, migration) while both macro and regional impacts of policies are simulated. Why does geography get such an important focus in the system? Why is the system called “regional” and “macro” at the same time?

Geography plays a critical role in development policy effectiveness for at least four major reasons. First, interventions happen at a certain point in space and the impacts might spill over to proximate locations to a considerable extent. Second, the initial impacts could significantly be amplified or reduced by short run (static) agglomeration effects. Third, cumulative long run processes resulting from labor and

capital migration may further amplify or reduce the initial impacts in the region resulting in a change of the spatial structure of the economy (dynamic agglomeration effects). Forth, as a consequence of the above effects different spatial patterns of interventions might result in significantly different growth and convergence/divergence patterns.

"Regions" are spatial reference points in the GMR-approach. They are sub-national spatial units ideally at the level of geographic aggregation, which is appropriate to capture proximate relations in innovation. Besides intraregional interactions the model captures interregional connections such as knowledge flows exceeding the regional border (scientific networking or spatially mediated spillovers), interregional trade connections and migration of production factors.

Important regional dimensions that may crucially determine the growth effects of development policies include the following aspects.

- Regional development programs are built on important *local specificities* (industrial structure, research strengths of the region, size and specialization of human capital etc.).
- Models have to capture the effects of policies on *local sources of economic growth* such as technological progress, investment and employment.
- The models also need to be able to follow those cumulative *agglomeration impacts* such as intensifying localized knowledge spillovers and their feedback mechanisms that may arise as a consequence of policies.
- There are certain additional impacts on the regional economy instrumented by *Keynesian demand side* effects or *Leontief-type intersectoral* linkages.
- Most of the infrastructural programs target better physical *accessibility*. Impacts of these policies on regions that are (directly or indirectly) affected also have to be reflected.
- There are different mechanisms through which policies implemented in certain regions affect other territories such as *interregional knowledge spillovers and trade linkages* and as such these effects also need to be incorporated in model structures.

The "macro" level is also important when the impact of development policies is modeled: fiscal and monetary policy, national regulations or various international effects are all potentially relevant factors in this respect. As a result the model system simulates the effects of policy interventions both at the regional and the macroeconomic levels. With such an approach different scenarios can be compared on the basis of their impacts on (macro and regional) growth and interregional convergence.

The GMR-framework is rooted in different traditions of economics (Varga 2006). While modeling the spatial patterns of knowledge flows and the role of agglomeration in knowledge transfers it incorporates insights and methodologies developed in the

geography of innovation field (e.g., Anselin, Varga and Acs 1997, Varga 2000). Interregional trade and migration linkages and dynamic agglomeration effects are modeled with an empirical general equilibrium model in the tradition of the new economic geography (e.g., Krugman 1991, Fujita, Krugman and Venables 1999). Specific macroeconomic theories are followed while modeling macro level impacts.

The first realization of the GMR approach was the EcoRET model built for the Hungarian government for ex-ante and ex-post evaluation of the Cohesion policy (Schalk and Varga 2004). This was followed by the GMR-Hungary model, which is currently used by the Hungarian government for Cohesion policy impact analyses (Varga 2007). GMR-Europe was built in the IAREG FP7 project (Varga, Járosi, Sebestyén 2011) and was recently extended (Varga and Törmä 2010) and applied for policy simulations for DG Regional Policy (LSE 2011).

2.3 GMR-Turkey: Geographic and temporal dimensions, policy variables

GMR models reflect the challenges of incorporating regional, geographic and macroeconomic dimensions in development policy impact modeling by structuring the system around the mutual interactions of three sub-models such as the Total Factor Productivity (TFP), Spatial Computable General Equilibrium (SCGE) and macroeconomic (MACRO) model blocks. Following this approach the macroeconomic model of GMR-Turkey calculates policy impacts at the national level while the 26 NUTS 2-level regional models provide results at the regional level. The model system provides policy simulation results for the 2015-2030 time period.

Some of the ENP policies suggested in the SEARCH project can be modeled in the macroeconomic block (such as changes in international trade) via policy shocks affecting specific macroeconomic equations. However, most of the policy suggestions target stimulating the regional base of economic growth such as investment support, infrastructure building, human capital development, R&D subsidies, promotion of (intra- and interregional) knowledge flows. In the following sub-section we focus on mechanisms of these latter policies.

2.4 Regional impact mechanisms of the main policy variables

2.4.1 R&D support, interregional knowledge networks and human capital

Figure 1 provides a schematic figure on the way the impacts of policies targeting R&D support, interregional knowledge networks and human capital are modeled in the TFP block.

Economically useful new technologies are measured by number of patents in the model. R&D support and interregional networks affect the economy via its impact on patenting. Increasing patenting activity affects positively regions' general technological levels (measured by the stock of patents), which determines productivity measured by Total Factor Productivity. In the model the extent to which technological development affects TFP is influenced by human capital in the region. The impacts of the promotion of R&D, networking and human capital on economic variables (prices of quantities of inputs and outputs, etc.) are calculated in the SCGE block. Economic impacts of increased productivity are modeled in the SCGE block in the following steps.

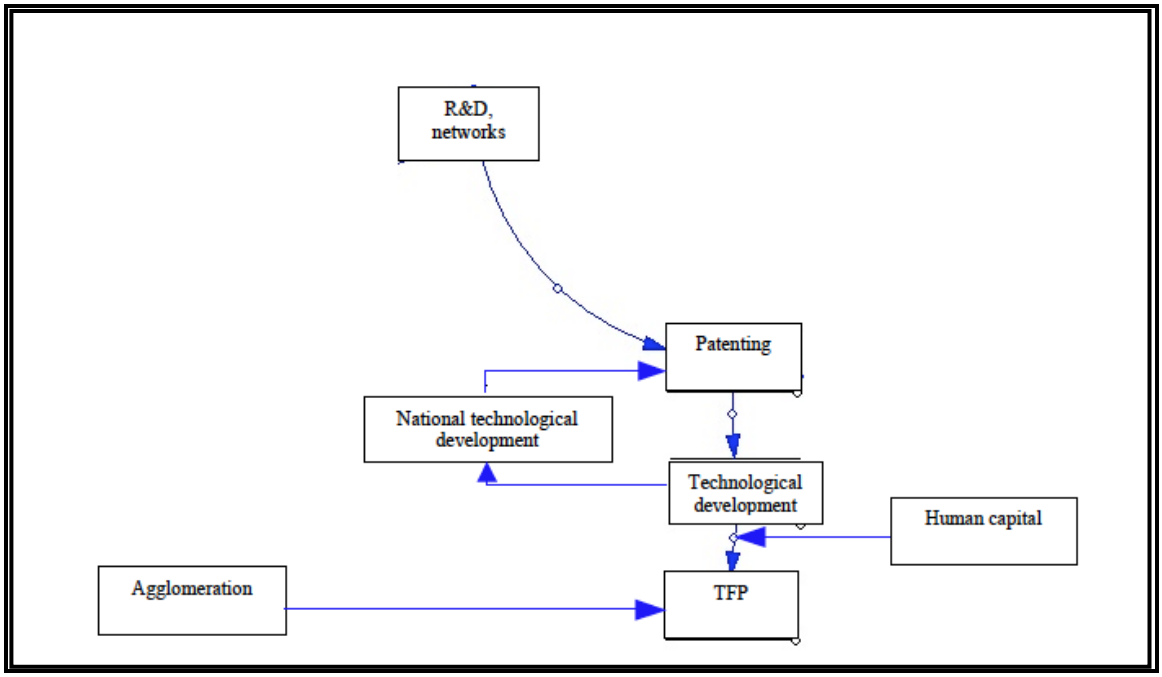

Figure 1: The impact mechanisms of R&D and knowledge networks and human capital promotion

1. Short run effects

The impact in the short run results from the interplay between the substitution and output effects. Assuming that the level of production does not change the same amount of output can be produced by less inputs that is the demand for capital (K) and labor (L) decrease as a result of the interventions. However increased TFP makes it also possible to decrease prices to keep firms more competitive, which positively affects demand. This latter effect is called the output effect. The interaction of output and substitution effects might result in the increase of the demand for factor inputs (K and L) but also the impact can be just the opposite. What will actually happen is an empirical question. In case output effect exceeds substitution effect wages will increase in the short run, which together with the relative decrease in prices will result in increasing consumption and higher utility levels.

2. Long run effects

Increased utility levels result in in-migration of labor and capital into the region, which will be the source of further cumulative effects working via centripetal and centrifugal forces. Labor migration increases employment concentration, which is a proxy for positive agglomeration effects in the model. According to findings in the literature localized knowledge spillovers intensify with the concentration of economic activity in the region (e.g., Varga 2000). A higher level of employment thus increase TFP (as shown also in Figure 1), which further reinforces in-migration of production factors following the mechanisms described above. However increasing population also affect the average size of flats negatively which works as a centrifugal force in the model. The balance between centrifugal and centripetal forces will determine the long term cumulative effect of policies at the regional, interregional and macroeconomic levels.

3. Changes resulting from interventions on the quantities and prices of outputs and factors are calculated in the SCGE model both in the short run as well in the long run.

2.4.2 Infrastructure investments

Infrastructure investments increase the level of public capital in the region. It is modeled via a Cobb-Douglas production function where the inputs are labor, private and public capitals. Thus infrastructure investments are modeled as externalities, which eventually affect regional TFP levels. Public investments are also modeled in the macro model via the increase of public capital.

2.4.3 Private investment support

One of the policies suggested is the support of investment by small and medium sized enterprises. The mechanism of this policy instrument affects the model via the increase in private capital, which has further impacts on several other variables both in the region where the intervention occurs and in other regions connected by trade or migration linkages. Private investment support is also modeled in the macro model via the increase of private capital.

2.5 Macroeconomic impacts

The effects of policies are communicated to the macro model by changes in TFP (aggregated from the regional level) and changes in fiscal variables (such as the demand and supply impacts of investment support and physical infrastructure construction). Changing TFP results in an increase of GDP growth rate which, will increase factor demand resulting from their higher marginal productivities. As a result the level of GDP will be higher than what would be observed in its long run equilibrium path. Infrastructure investments and private investment support induce both demand and supply side effects. The demand side (e.g., increased government expenditures) effect on GDP is temporary while the supply side effects (via increased public and private capitals) stabilize in the long run.

2.6 Impact mechanisms in the GMR model

The mutually connected three model-block system is depicted in Figure 2 below. Without interventions TFP growth rate follows the national growth rate in each region. The impacts of interventions run through the system according to the following steps.

1. Resulting from R&D-related interventions as well as human capital and physical infrastructure investments (which increase public capital and eventually impact the level of TPF as well) regional Total Factor Productivity increases.

2. Changing TFP induces changes in quantities and prices of output and production factors in the short run while in the long run (following the mechanisms described above) the impact on in-migration of production factors imply further changes in TFP not only in the region where the interventions happen but also in regions which are connected by trade and factor migration linkages.

3. Increased private investments expand regional private capital which affects further changes in regional variables (output, prices, wages, prices, TFP, etc) in the SCGE model block. The impact of private investment support affects the macro model as well via increased private capital.

4. For each year changes in TFP are aggregated to the national level then this increases TFP in the macro model as time specific shocks. The macroeconomic model calculates the changes in all affected variables at the national level.

5. Changes in employment and investment calculated in the MACRO block are distributed over the regions following the spatial pattern of TFP impacts.

6. The SCGE model runs again with the new employment and capital values to calculate short run and long run equilibrium values of the affected variables.

7. The process described in steps 5 and 6 run until aggregate values of regional variables calculated in the SCGE model get very close to their corresponding values calculated in the MACRO model.

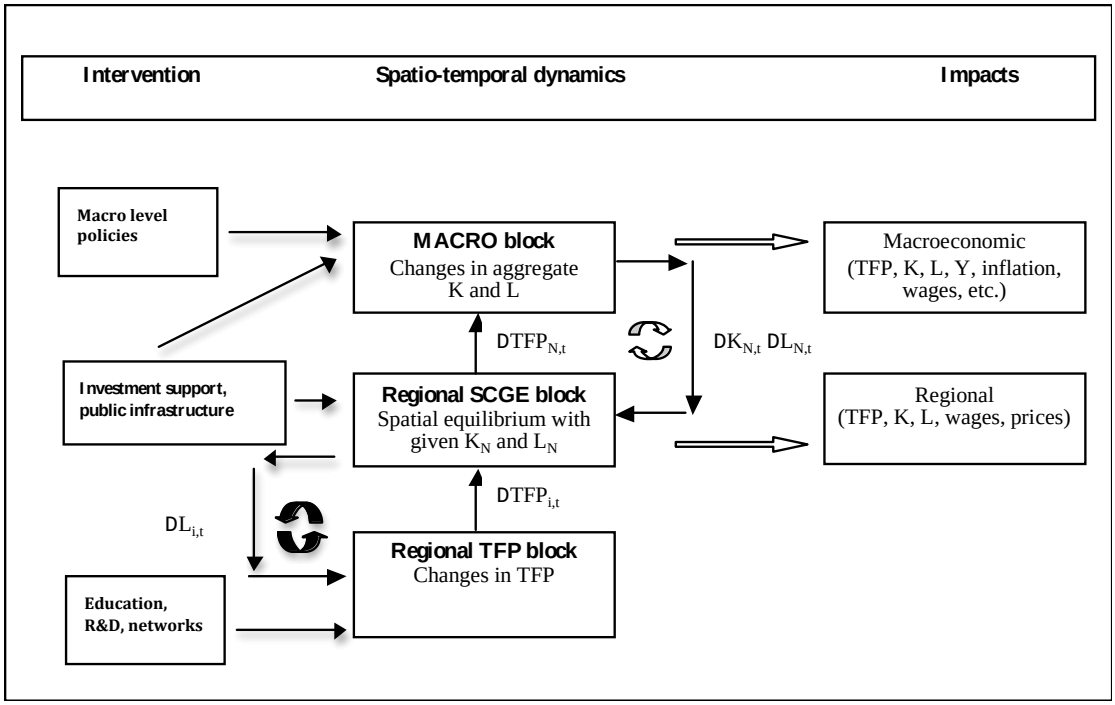

Figure 2: Regional and macroeconomic impacts of the main policy variables in the GMR-Turkey model

3. The policy study area: The TR72 Kayseri, Sivas, Yozgat Region

The policy inferences discussed in section 2 cover a wide range of interventions which deserve a careful study on their potential impacts on ENP regions. Having discussed these policy inferences under two divergent scenarios, namely a conservative-traditional scenario vs. a technology-innovation based scenario, it becomes possible to execute a comparative study on their likely outcomes on ENP regions. The selection of a sample region for such a study is of considerable importance, since the selected region needs to provide opportunities for such a comparative study. First of all, as discussed in section 2, policy inferences have pointed out that either in the traditional approach or in the technology based approach, regions' local assets and structures should be taken into care when designing policy

interventions. It is thus desirable to select a sample region where the impact of these two policy approaches can be tested.

For these reasons the GMR-Turkey Policy Impact Model is applied to TR72 Kayseri-Sivas-Yozgat Region, which, from now on will be briefly called the Kayseri Region. Kayseri Region is considered as a good representative of many ENP regions providing opportunities to test the following two policy approaches coming from SEARCH Project findings:

- A conservative scenario: ENP countries should intensify trade relationships with CEE regions where competition is less fierce (WP 2)
- A technology development scenario: ENP countries need to develop regional innovation infrastructures (human capital, R&D, international networking, etc.) to become more competitive in global markets subsequently (WP3, WP4)

3.1 Regional administration and features

The TR72 Kayseri Region is classified as a NUTS2 level region. The region consists of three provinces, Kayseri, Sivas and Yozgat, which are classified as NUTS3 level regions and possess provincial administrations. The region accommodates about 3% of the Turkish population about 2.3 million while covers around 8% of the land of Turkey. The population density is thus low. The provincial centres of Kayseri, Sivas and Yozgat are important cities, and share the same names as the provinces. The Orta Anadolu Kalkınma Ajansı (Mid-Anatolian Regional Development Agency) is responsible for strategic planning and application of Turkish and EU regional policies in the TR72 Region.

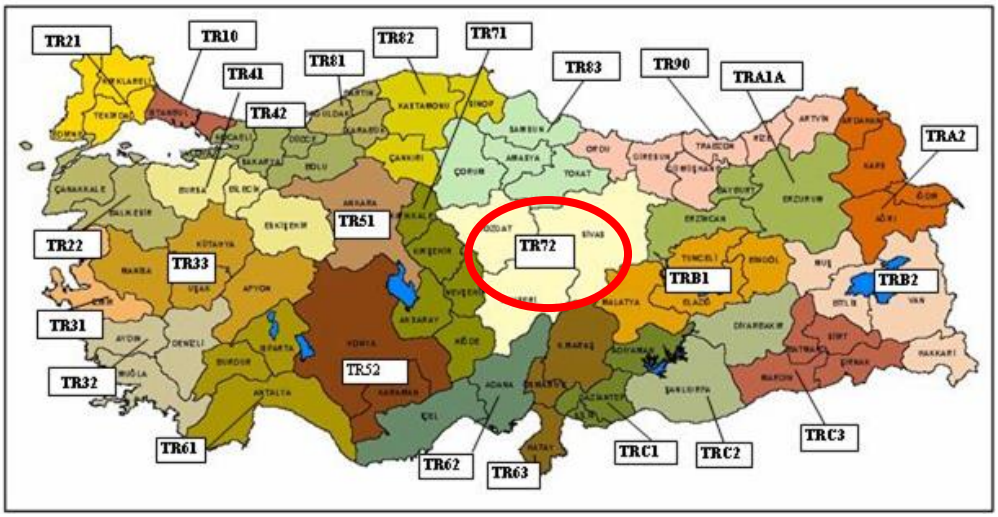

Figure 3: The TR72 Region on the map of Turkey

Table 1. Main demographics and area data of TR 72 Kayseri Region

Population	2 351 714 (2012)
Share of Population in the country	3.11%
Population growth	0.48% per annum
Area	59 664 sqkm
Population Density	39.4/sqkm

3.2 Economic structure

The TR72 Kayseri Region has an annual GVA of about 13 billion USD (2012), which is about 2.4% of the national GVA according to TURKSTAT Regional Accounts Data. Thus, the region has a lower than average income level since it accommodates about 3% of the population. Since the region possessed less than 75% of the average GDP of Turkey, it was designated as a Priority 1 region in the Regional Competitiveness Operational Program under Instrument for Pre Accession (IPA) of the EU, as indicated by the Ministry of Industry, Science and Technology of Turkey. Furthermore, Province of Kayseri in this region is designated as one of the 15th growth centres.

The province of Kayseri is more developed and has a more diversified industrial structure. The province possesses some low tech and medium technology sectors, and to an extent some R&D functions while it also possesses a large rural area. Industries have not as much developed in Sivas and Yozgat provinces, and mostly resource based industries exist (ORAN, 2013, Yeldan et al, 2013).

Producer services in the TR72 region are not developed. To an extent, winter sports tourism is developed in the Province of Kayseri, and some limited cultural tourism activities exist in the NUTS2 region. Rural and agrarian activities have a significant share in the economy.

Table 2. Economic Indicators of TR72 Kayseri Region

Total GVA in Euros 2012 Current Prices	10.7 billion EUR (2012)
GVA per capita	4 574 EUR
Turkey Average GVA per capita	5 977 EUR
Share of GVA among Turkish Regions	2.38%
GVA Growth in fixed TL	3% per annum (2004-2012)

TR72 region is selected as a sample since the region in general possesses diversified industries in low to medium level technologies, but there are also sectors with R&D and innovation potentials. Food and beverages, furnitures, textiles and clothing, machinery, defence, plastics-lastics (tires) and construction materials industries are well established in the region. The TR72 Region Regional Development Strategy Plan for 2014-2020 (ORAN, 2013) provides that low to medium technology sectors are agglomerated in the region, possessing an average level of diversification (see Figure 4).

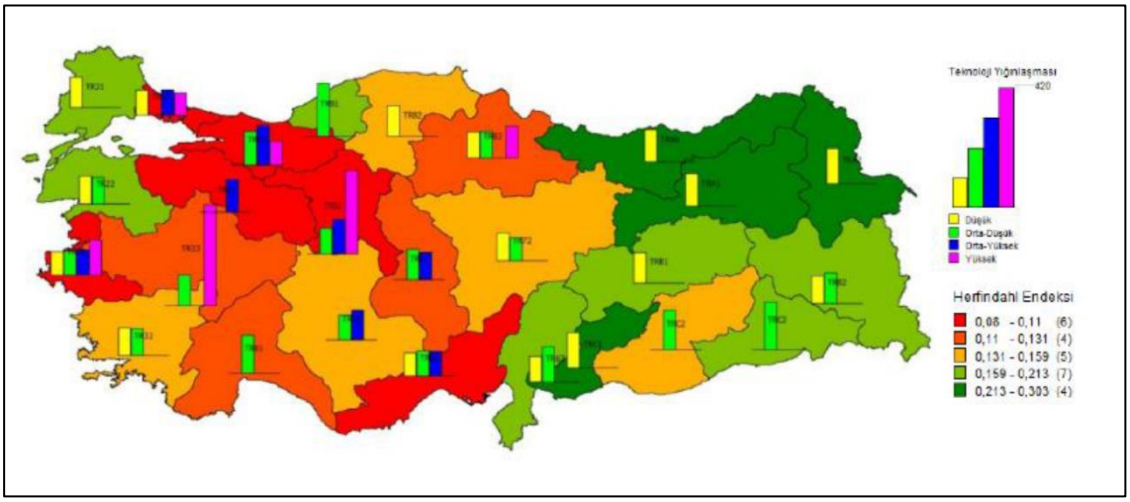

Figure 4: Technology agglomeration levels of NUTS2 regions in Turkey

Source: 2014-2020 Regional Development Plan of TR72 Region, Mid-Anatolian Development Agency – ORAN, 2013.

The region, is open to international trade. The exports of Province of Kayseri is about 1.09% of the national exports, while in Sivas it is only 0.05% and in Yozgat it is a negligible amount, 0.01%. The exports are about 1.2 billion USD. The region's imports are much higher, about 1.6 billion USD. Similar to Turkey's general unbalanced trade structure, the Region experiences a deficit of trade. The imports of the Province of Kayseri sum to 0.72% of the country, while that of Sivas is 0.04% and Yozgat's imports are about 0.01%. Thus, the source of deficit is the Province of Kayseri.

Top five export partners of the region are Iraq, Germany, USA, China and Italy. In the imports, Russia, Kazakhstan, China, Germany and Italy are the first five trade partners. There are some exports to neighbouring countries, such as Azerbaidjan and Iran, and in very small amounts to Romania and Bulgaria. However, in imports neighbouring countries like Ukraine, Romania, Iran and Azerbaidjan are among top ten trade partners (ORAN, 2013). The trade patterns of TR 72 Kayseri Region point to similarities to other ENC regions, where there are asymmetric trade relations with the EU 15, as found by SEARCH studies and discussed in section 2.

The TR72 Kayseri Region has 8 organized industrial districts, and has yet as much planned but unconstructed industrial land available, creating a significant opportunity for further development. Therefore it provides scope for expansion of current low and medium technology industries, which could lead to increasing exports to new member states of the EU, if paired with suitable transport improvements.

3.3 Human capital and mobility

Despite presence of established schools and universities, The TR72 Region still experiences an above national average illiteracy rates of about 6.46% (versus the

country average of 4.8%). High rates of informal employment, very high rates of unemployment among young semi-skilled and skilled workers influencing both males (59% for skilled males and 39% for semi-skilled females) demonstrate that there is an important mismatch in the labour market, similar to findings in the SEARCH project. Despite this mismatch, number of persons attained tertiary education in the region has increased from 7.9% to 9.9% from 2006 to 2012.

The region was designated as a Priority 1 region in the Human Resources Development Operational Programme under IPA. Under this program, the region received significant supports, which were more in line with the conservative-traditional policy approach, where most of the supports were addressing women's employment in personal and social services, rather than increasing human capital and technological skills. This is in sharp contrast with the challenging vision of Turkey to become one of the top exporting countries in the world by 2023, as well as strategic documents addressing specific industrial clusters, that are as well present in the region.

Under IPA Program 2007-2013, the allocated support for Turkey was 4.8 billion €'s according to Ministry of EU Affairs, Turkey. According to Regulation (EU) No 231/2014 of the European Parliament and the European Council, of 11 March 2014, 11.6 billion Euros will be provided for Accession countries during 2014-2020 under the Instrument for Pre-accession Assistance (IPA II). IPA II program is expected to support Turkey's regional policy by another 4.5 billion €'s during 2014-2020 period, where one of the components will be human resources development as in IPA. If funds will be used similar to previous IPA program, a traditional-conservative scenario is more likely to prevail. However, Turkey's Regional Development National Strategy draft document points that the Turkey's Strategy Document to use EU funds is still under preparation by the EU and thus the results of our simulations here are important in providing insights for this important document.

An important policy inference as discussed in section 2 is that regions could benefit temporary migration and short term mobility of skilled – semi skilled workers since the returned migrants would bring in new knowledge and skills, thus increasing local human capital. The Region currently benefits EU programs such as ERASMUS but our investigation shows that the level of participation is well below the desired levels. Newly started programs by Turkey such as the Mevlana Program could improve mobility of students and academics. Other mobility programs supported either by the EU and Turkey could improve mobility of other important actors such as skilled workers in industries, as suggested by policy inference 3.1.

3.4 R&D and innovativeness

The region's registered patent stocks are very low, similar to most of the regions in Turkey. Despite the high number of patent applications, mostly originating from the Province of Kayseri, success level in having registrations is extremely low. Patent applications from the other two provinces are negligible.

Furthermore, despite increasing R&D expenditures patent registrations do not increase, and remains very low. Average patent registrations per 100.000 people were about 0.38. Only 9 patents out of 1027 registered in year 2012 belonged to the region, despite 83 applications. This structure implies that there could be structural, institutional or human capital problems associated with innovativeness.

The region also experiences difficulties in attracting higher technology sectors. Despite incentives given to the region, our assesment on incentives data during 2005-2012 demonstrates that high levels of investments were made in low technology sectors, and very low levels of investments were made in professional and scientific activities. The region could not also attract a good share of the strong FDI investments to Turkey during the last decade. A brief look at the geographic distribution of incentives used by FDI companies show a pattern of clustering in already well developed industrialized regions, despite lower incentives given to these regions. Therefore, institutional quality, accessibility and existing static-dynamic externalities are likely to overweight small differences in levels of incentives given to different regions. As found in SEARCH studies, and discussed in section 2, ENP regions are likely to benefit more from EU based FDI due to higher knowledge spillovers created by them. Following policy inferences 1.10 and 3.31, if the new incentive programs became more attractive to attract FDI to regions similar to TR72 Region, the odds for a technology-innovation driven development scenario would increase.

Furthermore, the TR72 Region's imports are also lower technology products. Combined with local structural difficulties, it may be claimed that the region has low capacity in absorbing new technologies and it does not benefit much from knowledge spillovers and has low capacity in developing technologies locally.

The region has benefited the Regional Competitiveness Operational Program under IPA. The TR72 Region was able to receive support for technology parks, incubators and networks during the 2007-2014 period. There are also some approved supports in these subjects that are yet to be provided. There were also supports to process upgrading projects for manufacturing industries.

The Regional Development Strategy Plan for 2014-2020 aims at increasing innovativeness and supporting higher technology sectors such as opticals and machinery in the region. The Region has been successful also in receiving a multi-year support for a technology transfer office starting from 2014, through a program by Turkish Science and Technology Foundation TÜBİTAK. The designated support will be 1,000,000 Euros per year, up to 10 years. All these suggest that the region may be evaluated under policy inferences 1.5, 3.23, and 1.12. Thus, the region is a good sample for evaluating a technology-innovation driven development scenario.

3.5 Investment supports

During the 2005 to 2012 period, the provinces in the TR72 Region was designated as among priority areas with higher incentives provided to investors. 12 600 jobs were

created during this period in the region, through incentives, which is flatly in line with country average. Most jobs were created in the forestry products (furniture), textiles and plastics industries.

While on par with national average in terms of job creation, the region was not very successful in attracting large companies, and FDI companies. Attracting such companies are deserved since they are believed to bring in new technologies and also lead to knowledge spillovers in a region. However, current investment sentiment supports more of a traditional-conservative development scenario rather than a technology-innovation driven development scenario. As discussed above, a significant change in the design of incentives programs could rather support a technology-innovation driven development.

3.6 Accessibility

Turkey's inland motorway system is still not integrated at a desired level as in a developed country context. The highway system represents more like a tree-branch form, enabling access to ports and nearby hinterland. The Trans-European Motorway extends from the Turkey's border to Bulgaria and Greece and only to Ankara. TR72 Region currently remains out of these highway networks.

Due to pressing transport and logistic needs double carriageway roads are built recently that complement the highway system, creating a better and interconnected road network. Although speeds and carriage capacity is lower, this has at least improved intra-regional transport capabilities.

TR72 Region is likely to benefit from ongoing projects that aim to improve West-East connections. A plan is to connect the Trans European Motorway connection as far as to the border of Iran through the Gerede-Merzifon-Gürbulak axis. This axis will be accessible from the TR72 Region improving accessibility to Istanbul.

Another important West-East axis project is the one between Izmir and Kapıköy, which passes straight from the Province of Kayseri. By reaching the port city of Izmir the accessibility of TR72 Kayseri Region will significantly improve. Information on these projects can be retrieved from the Directorate of Highways of Turkey (Karayolları Genel Müdürlüğü, www.kgm.gov.tr).

There is also another group of road projects focusing on improving North-South accessibility, which enables access of inland regions to the Black Sea as well as the Mediterranean. An important road connection directly passing through the region, will provide faster access to Samsun and Sinop ports in the North while also to Mersin Port in the South. Samsun and Sinop ports will provide important opportunities such as accessing to Constanze in Romania, Varna and Burgas in Bulgaria, Odessa in Ukraine and Novorossiysk in Russia. Especially access to Samsun port is important in export of bulk goods such as furnitures by-passing transport problems at the border of Turkey-Bulgaria.

Passenger rail connections are also being improved. The Ankara-Sivas high speed train connection will decrease trip duration from 12 hours to only 2 hours, significantly improving mobility. The Istanbul-Sivas trip will decrease to 5 hours, another major improvement. In the long run, the Province of Kayseri is also expected to join the high speed train network. Information on these projects can be retrieved from the State Railways of Turkey (T.C. Devlet Demiryolları, www.tcdd.gov.tr).

Sivas and Kayseri are already important nodes in the existing conventional national freight rail system. The connection between Sivas, Kayseri and Mersin port are expected to be upgraded in terms of capacity until 2023.

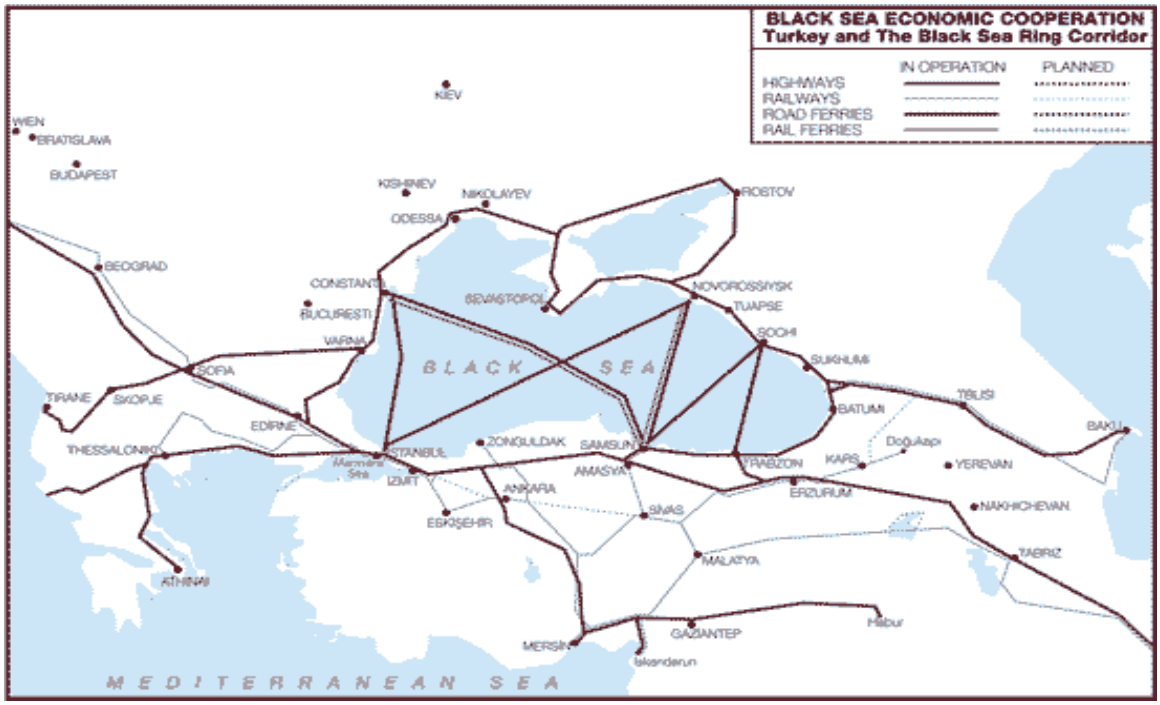

Figure 5: Projects planned and underway to increase the accessibility of Turkish regions

5. Policy impact scenarios: Traditional or technology-based development?

5.1 Scenario set-ups

In order to estimate the likely economic effects of policy prescriptions arising from the SEARCH project we designed two scenarios: the Conservative scenario and the Technology development scenario. The financial source of the interventions in the simulations is the planned 2014-2020 budget of the Instrument for Pre Accession (IPA) of the EU. We assumed that the TR72 region follows the same success rate in earning IPA financed projects as was experienced in the previous planning period (which was about 15%). Thus we designed two SEARCH policy scenarios where different distributions of the same total IPA financial support are assumed.

In order to contrast the two scenarios that reflect policy prescriptions of the SEARCH project with actual policies followed in TR72 we designed a third scenario where we

assumed that the distribution of the IPA budget across policy measures follows the same pattern in the next period as was experienced between 2007 and 2013. We call this scenario the Current IPA scenario. IPA projects were categorized into three classes: support of private investments, R&D funding and the promotion of human resources development (education). Table 3 presents the different allocations of support for the whole period in the Kayseri Turkish NUTS2 region. In all the three scenarios we assumed an even distribution of financial supports across years during the 2014-2020 planning period.

Table 3. Scenarios with different distributions of the planned total IPA support in the Kayseri Turkish NUTS2 region (2014-2020), million EUR (2012)

	Investment support	R&D support	Human resources development	Total support
The Current IPA scenario	28.80	24.71	4.13	57.63
The Conservative scenario	57.63	0.00	0.00	57.63
The Technology development scenario	19.21	19.21	19.21	57.63

***Source*:** Information retrieved from Ministry of Labor and Social Security, Ministry of Industry, Science and Technology, and Ministry of Food, Agriculture and Husbandry of Turkey. Data derived from announced IPA projects that are funded.

In the Conservative scenario following policy suggestions arising from some of the SEARCH research results we assumed that the IPA budget is mainly used for supporting investment in traditional industries which are considered competitive in those member states of the EU that accessed in the last waves after 2004. Thus we allocated the total budget to investment support. Following suggestions from other research papers from SEARCH we designed the Technology development scenario where we assumed that the total IPA budget is allocated equally to the three categories considered: investment support, R&D funding and human resources development.

Additional to pecuniary regional policy measures we included other policy instruments in our scenarios. In the Conservative scenario we supposed the introduction of two measures by the Turkish central government. On the one hand we assumed that the central government of Turkey makes important steps to intensify trade with CEE EU countries by easing export regulations. On the other hand the construction of new highways is assumed in order to improve the connection of the Kayseri region to an important Black Sea port, Samsun. In Figure 6 the planned new highways are highlighted with yellow lines while motorway fragments that are already under construction are indicated by red color. It is supposed in the scenario that as a result of the new highway transportation costs of Kayseri region products declines which increases their competitiveness in CEE markets. We assumed in the simulations that the new highways will be in operation from the beginning of 2018.

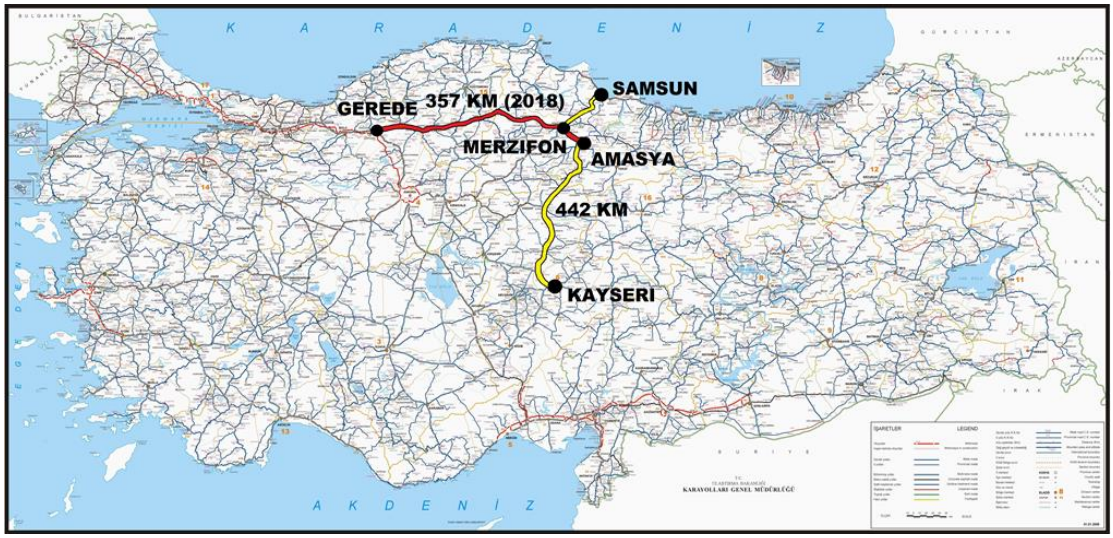

Figure 6: Highway extensions in the Conservative scenario
Notes: New highways of the scenario are highlighted with yellow lines while motorway fragments already under construction are indicated by red color.

In the Technology development scenario the set of financial instruments indicated in Table 3 is extended by some specific, innovation related measures suggested by SEARCH studies. The first of such instruments reflects policies targeting more successful participations in EU funded research projects. We measure the quality of EU research networks by the ENQ (Ego Network Quality) index introduced by Sebestyén and Varga (2013). Higher values of this index reflect participation in higher quality networks measured by the number and initial knowledge of immediate research partners, their willingness to interact with each other and the extent to which the immediate partners can help access novel knowledge by being connected to more distant partners in the whole EU research collaboration network. We assumed that Turkish science & technology policy & partnership to Horizon 2020 Program successfully increases the ENQ index of the TR72 region by 10 percent over the seven year time period.

The likely positive effects of remittances on human capital are also emphasized in some of the SEARCH project results. Following Kifle (2007) we assumed that a 1 percent increase in remittances income increases the share of remittances spent on children's education by 6.4 percent. In our scenario policy successfully increases remittances incomes in the TR72 region by 10 percent over the seven year time period.

We also assume that the Central government of Turkey finances a highway construction project to better connect the Kayseri region to core EU markets where more technology based products of the region are supposed to be sold. Figure 7 depicts the new highway fraction. It is supposed in the scenario that as a result of the new highway transportation costs of Kayseri region products declines which increases their competitiveness in Western markets. We assumed in the simulations that the new highways will be in operation from the beginning of 2018.

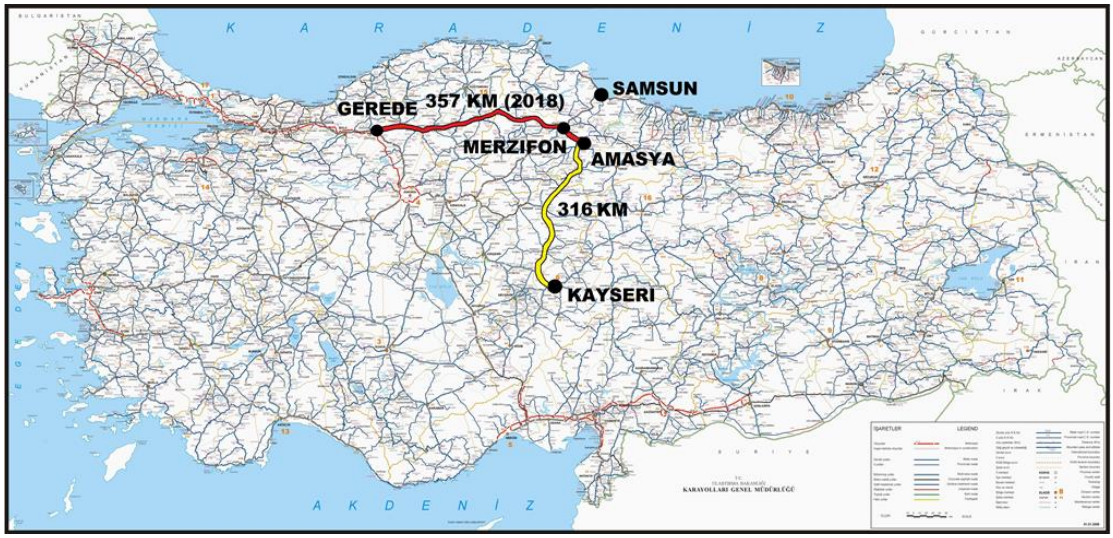

Figure 7: Highway extensions in the Technology development scenario
Notes: New highway of the scenario is highlighted with a yellow line while motorway fragments already under construction are indicated by red color.

5.2 Scenario results

In this sub-section we present our Conservative and Technology development scenario results on three policy outcomes: the impact on TR72 regional GDP, on the national GDP and on interregional inequalities in Turkey.

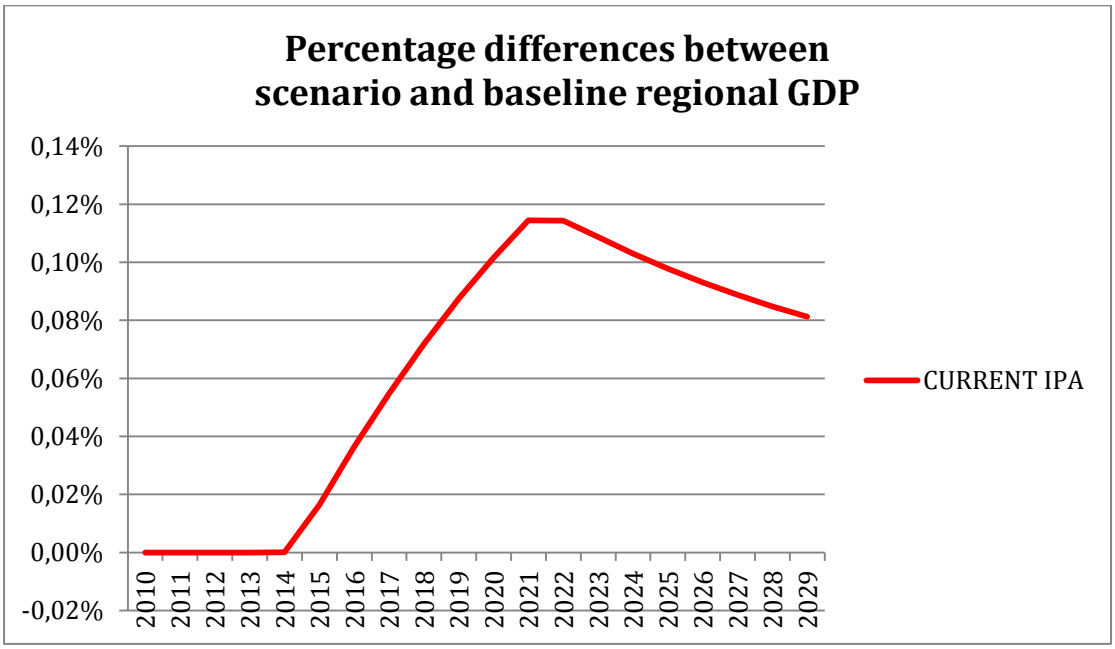

Figure 8: The effect of the Current IPA scenario on TR72 GDP

As a benchmark case we first calculated the likely impacts at the regional level of a policy that would follow the 2007-2013 planning period distribution of the IPA budget across the three main categories. Figure 8 presents scenario results on regional GDP. The values are percentage differences between GDP calculated following the Current IPA scenario and the GDP which is assumed in the case of no intervention (i.e., the baseline scenario). The red line depicts the temporal pattern of policy impacts. Interventions are equally distributed across the years of the planning period. The first year when a small impact already observed is 2015. Starting with this year

the impacts on regional GDP increases until it saturates in 2021 and 2022 at about 0.12 percent. After 2022 the impact decreases with a decreasing speed until it reaches its long term level (not shown in the Figure). This long-term impact reflects changes induced by policy actions in the production structure of the regional economy. A higher stock of capital, some increase in the regional knowledge base and more educated people bring regional output to a higher level.

Figure 9 presents the results of the Conservative scenario. It is assumed that the total IPA budget is allocated to investment support in traditional industries. As shown in the Figure the highest impact of investment support (denoted by the dotted green line) is estimated for 2022 at a value of about 0.045 percent. Following policy suggestions in the SEARCH project we also assumed that the Central government of Turkey successfully introduces policy measures to increase export demand. As indicated by the top dashed green line in the Figure a two percent increase in export will likely increase the peak impact in 2022 to about 0.075 percent. In case accessibility to the Black Sea port in Samsun is improved by a highway investment, it will start increasing regional GDP in 2022. As the Figure shows the highway will increase the impact of export promotion policies over time. The peak total impact of all the policies included in the Conservative scenario is about 0.075 estimated for the year 2022.

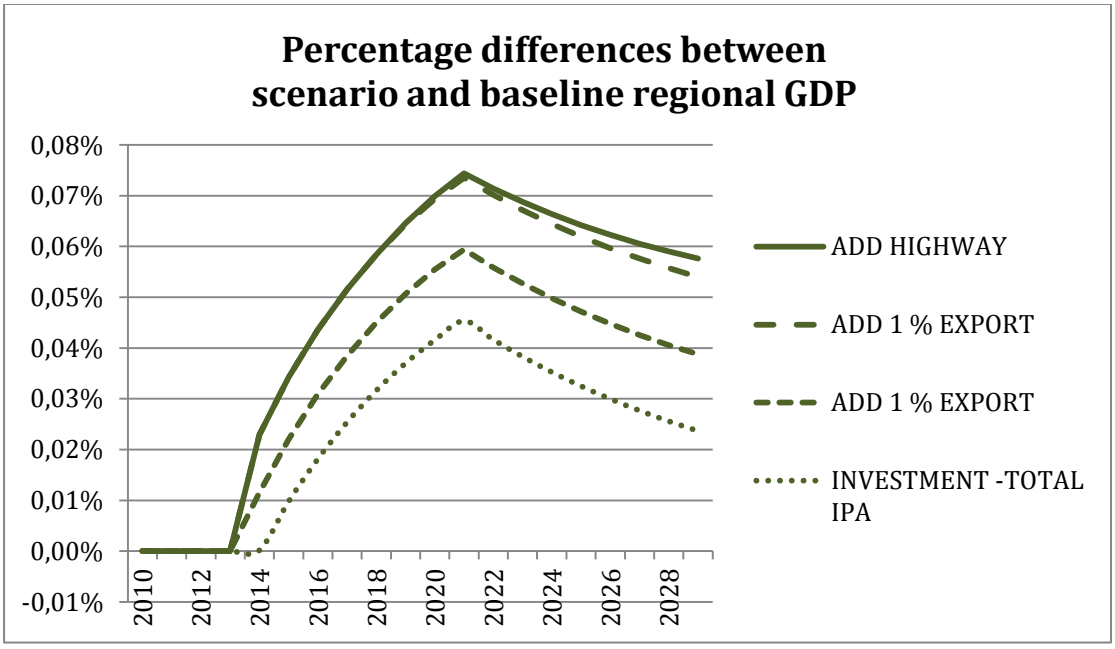

Figure 9: The effect of the Conservative scenario on TR72 GDP

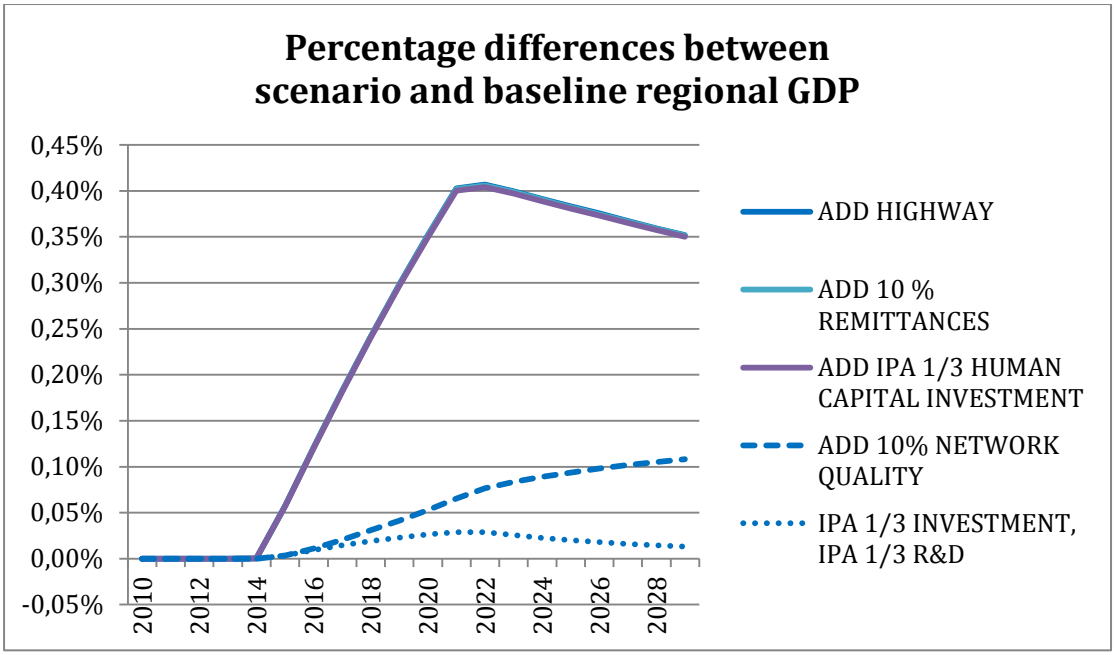

Figure 10: The effect of the Technology development scenario on TR72 GDP

Figure 10 depicts simulation results of the Technology development scenario. Investment support paired with R&D funding has a relatively minor impact compared to impacts observed in the previous two scenarios. The peak year is 2021 with an about 0.0025 percent improvement on regional GDP (as shown by the blue dotted line). However, it seems that policies aiming at improving HORIZON 2020 participation help bring new knowledge into the TR72 region and with this new knowledge the utilization of the budget spent on R&D becomes more efficient (depicted by the blue dashed line). As indicated in Table 3 one-third of the IPA budget is allocated to human capital development. It seems that this policy is one of the most effective knowledge-based policies for the TR72 region. With investments in education the peak impact in 2022 increases to 0.40 percent. According to the simulations the 10 percent increase of remittances income in the TR72 region over the planning period does not have meaningful impacts on human capital and regional GDP. Also, improved accessibility by the construction of the new highway does not seem to improve the GDP impact of knowledge based policies over the observation period.

In Figure 11 we compare the impacts of the three scenarios on regional GDP, national GDP and on interregional inequalities. Following previous notation the Current IPA scenario results are marked by the red lines, the Conservative scenario impacts by the green lines and the Technology scenario effects by blue lines[1]. The Figure indicates that the Conservative scenario does not reach the effectiveness of even the Current IPA scenario. That is a pure investment support even if it is paired with export promotion (as the comparison of the peak values of Figures 8 and 9 suggests) does not

[1] Note that we depicted the impacts of the traditional scenario without accounting for the effects of the 2 percent increase in export. The specific reason is that the model is not capable of differencing between export increase impacts on a particular region and the impacts on all the regions at the national level. Consequently the export impact at the national level would include increased the effects of export activities in all the regions of Turkey and not only the impacts doming from the Kayseri region.

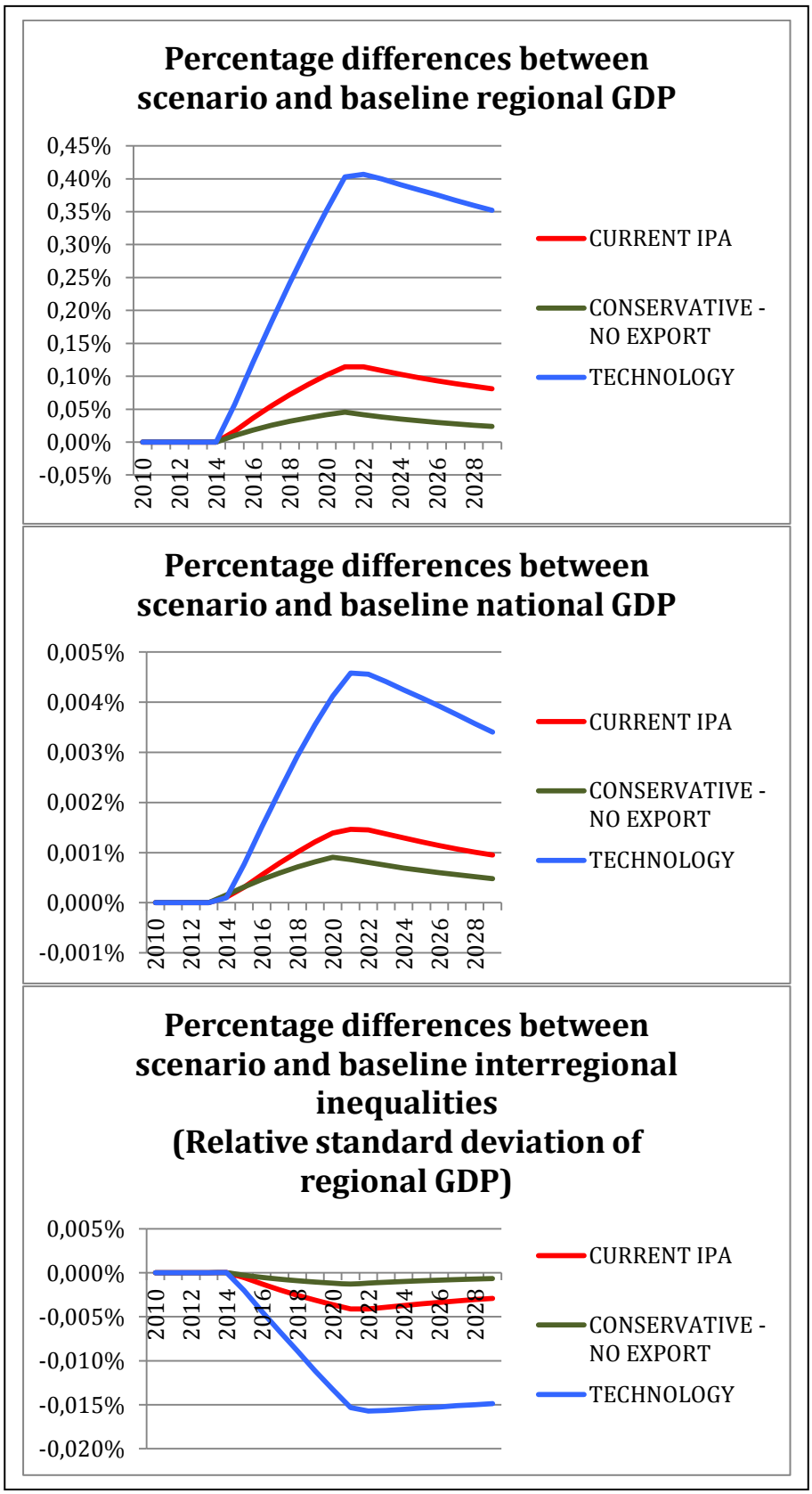

Figure 11: Comparison of the effects of the three scenarios on regional GDP, national GDP and interregional inequalities

seem to be more effective than the current policy governing the spending of the regional IPA budget. Figure 11 suggests that even in Kayseri region technology development seems to be a realistic option for policy. R&D and investment support paired with increasingly better positions in EU knowledge networks and investments in human capital could transform the region to a more successful territory of Turkey in the longer run. National level impacts are also presented in Figure 11. The Technology development scenario effect results in the highest impacts on both Turkey's GDP and on regional cohesion.

6. Summary

In this report we presented our policy impact analysis results which we carried out with the application of the GMR-Turkey model. The policy measures incorporated into the simulations followed suggestions reached in research of the SEARCH EU FP7 project. We grouped policy suggestions into two alternative sets of measures which became the bases of two alternative scenarios, the Conservative scenario and the Technology development scenario. The target region of our simulations was the Kayseri NUTS2 region (TR72) of Turkey. As argued in the report we can consider this region as being quite close to the economic characteristics of typical ENP regions. Policy impacts on regional GDP, Turkey's national GDP and interregional inequalities are estimated in the paper. Our results suggest that a persistent and systematic long term regional technology development-based economic policy which applies measures such as investment, education and R&D support, promotion of better connectedness to EU research networks and increased physical accessibility could in the longer run result in higher levels of regional and national production together with decreasing interregional differences than a scenario supporting the expansion of traditional industries in the region.

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