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PGlobal Project Spotlight: Assessing the Economic Benefits of Marmaray

## Uses and Misuses of Applied General Equilibrium Modeling

**Prof. Dr. Erinç Yeldan Professor of Economics, Yaşar University\***

Modeling of the general equilibrium system of a market economy is by no means an easy task. The twists and trade-offs of the market reveal an infinite array of solutions to un-countably many decisions of the "atomistic agents". Theory suggests that such trade-offs are governed by the "price signals" to which consumers respond via optimization methods of "calculus of pleasure"; and firms respond by the profit motive. Then, everybody comes together in the "market" where the iron laws of the invisible (in the context of competitive markets), or that of the visible (in the imperfectly competitive, oligopolistic markets) hand operates.

Even though the theoretical descriptions of the operations of the markets had reached to a sufficiently sophisticated degree of explanations, the state of the art of its empirical modeling has not yet developed into a completely satisfying status. However, for policy recommendations, economists are in need of devising methodologies for ranking alternative, possible strategies of solutions to the market problems.

One such very popular device that had proven useful in many applications in applied policy

framework is the computable general equilibrium (CGE) modeling paradigm that had been introduced in the late 1970s and 80s. CGE approach mimics the market behavior of participants via a simultaneous system of functional forms that portray decisions of the consumers and producers via production and demand functions, respectively. Production activities give rise to factor incomes which, in turn, become sources of savings and expenditures. In an open economy framework export and import functions as well as various other forms of foreign exchange are added to the system. Then we also add the "government" with all its relevant instruments of taxes, subsidies, sectorial investment and employment decisions, and, of course, rules of debt management.

One very important area of application of the CGE methodology is depiction of the structures. Understanding the structure of an economy with all its institutions, market types, factors of production and the role of governance is clearly the heart of economic analysis. The development economics literature explicitly recognizes the structural,

bottlenecks and rigidities that are often associated with developing country capitalism. However, the literature likewise recognizes that the usual two-sector models cannot distinguish between the different aspects of dualism that are endemic to developing countries. The basic underlying structure of those models consists of a backward sector, i.e., traditional agriculture and a modern, urban/industrial sector. What we witness in most parts of the developing world, however, is that in addition to this rural-urban dichotomy, these countries further suffer from the dichotomy of (i) traditional technologies in informal/marginalized production relations and (ii) modern technologies in more sophisticated institutional structures which encompass both the rural/agricultural and urban/industrial activities.

Another area of growing interest of CGE modeling is the economics of formation of customs unions and free trade blocs. Yet, economic studies tackling the issue have faced an inadequate theoretical framework. In the absence of any well-developed theory of regional trade zoning and formation, most analysts relied on simulation-based, applied general equilibrium modeling techniques to assess the impact of free trade blocs on output, accumulation, trade, and consumer welfare.

Previous CGE modeling work on trade reform had generally been applied within a static framework. However, such traditional CGE analyses could only account for the static, once-and-for-all effects, and were not able to capture the long run dynamic effects that involve intertemporal behavior such as saving and investment decisions. The incorporation of saving and investment decisions by way of "fixed" parameters and ad hoc "closure" rules in these approaches often led to non-robust policy results with arbitrary dependence on modeling specification. In the now more modern treatments of the CGE paradigm, modelers incorporate explicit intertemporal optimizing behavior on the part of rational agents, and thus, are able to investigate dynamic gains or losses of production or welfare.

#### And a word of caution

On the other hand, as all quantitative models, CGE apparatus had to be handled with care and transparency. It ought to state all its assumptions and data sources explicitly. It should always be remembered that all rabbits that come out of the hat, are in fact artifacts of the underlying hypotheses of the economy is purported to behave and any model is as good as the data that it had been based upon.

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## THEEMAR SME Investment Fund

**Mohamed Maher Mannai\***

### THEEMAR fund to fill the gap

THEEMAR will therefore fill this gap by providing SMEs with better access to finance and to financial products that are better tailored to their needs. It will consequently directly address the needs of socio-economic development and problems relating to unemployment in Tunisia.

Taking the lead initiative by creating an integrated full solution to the problems of SMEs financing, Caisse Des Depots Et Consignations of Tunisia (CDC) and (ICD), and with support from KIPCO group, Albaraka Bank and the Bank of Financing SMEs (BFPME), have launched the largest officially regulated fund. This is also the first ever Tunisian SME Shari'ah Compliant Fund and has the principal purpose of addressing the small and medium enterprises' (SMEs) funding gap by providing financial assistance in the form of growth capital to

suitable SMEs that are poised for exponential growth. In turn these SMEs can be expected to contribute to Tunisia's economic development and diversification by way of employment. This fund will generate roughly 1,000 employment opportunities with another 3,000 indirect employment opportunities.

### An innovative integrated solution for SMEs

THEEMAR is an innovative integrated solution for SMEs as it addresses the entire financing issues that face most SMEs from equity to technical assistance needs. It tackles the equity needs by way of direct investment and mezzanine. It solves the issue of debt financing by way of partnership with Albaraka Bank and the Bank of Financing SMEs (BFPME).



THEEMAR also addresses the working capital problems through the line of finance from the International Trade Finance Corporation (ITFC), a member of the Islamic Development Bank Group. At the same time the technical assistance grant will be used to compliment THEEMAR by assisting those SMEs to better enhance their capabilities and growth strategies.

THEEMAR will target an aggregate fund size of 50 million TND ( $\approx$  32 M USD) and has already completed the first closure of 25 million TND ( $\approx$  16 M USD) with considerable investor interest in the remaining tranche.

THEEMAR will invest in SMEs in various industry sectors in Tunisia with special attention given to promising sectors and to inner regions. THEEMAR will aim to provide accessible finance for growth and expansion to Tunisian SMEs via Islamic modes of

finance, as well as create a source of long-term high-yielding returns at the time of exit.

By concentrating on growth capital for relatively new businesses – of which there is a growing abundance in Tunisia - THEEMAR will reduce the volatility normally characterized with SME or early stage investments. Effectively, this approach will also leverage from experience, and complement the strategy, of traditional financing programs of banks. The use of the Islamic financing structure allows for the Fund to provide complementary funding with the senior debt of banks. In fact, by its nature, it will open the way for increased bank lines at potentially better lending rates.

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## Private Pension System

**Ali Burak Kurtulan\***

The Private Pension System in Turkey which was established in 2003 is complementary to the existing social security system. The main objective of the system is to help individuals to maintain their level of working life welfare, in the retirement period as well by accumulating regular contribution to pension funds and providing adequate pension income during retirement. The system is based on voluntary participation.

Any individual over 18 may enroll into the system by choosing one of pension companies. Next, the participant can decide on which funds to invest including deposits, government bonds and bills, stocks, gold, lease certificates etc. There are no minimum or maximum limits for contributions which can be paid monthly, quarterly, semiannually or annually.

At the beginning of 2013, a significant reform referred to as "state subsidy" introduced into the system in which the government makes a direct contribution to the accounts of participants. In the new incentive system, state subsidy that is equal to 25% of the contributions paid by the participants will be directly paid to participants' accounts. On the other hand, there is an annual limit for state subsidy depends on monthly gross minimum income. (3,000 TL for 2013)

An individual is eligible to get retired when he/she is over 56 years old and completes at least 10 years in the system. Besides, it is possible to leave the system prior to retirement. However, in this case, the participant will face with more tax deductions and will not be able to earn whole state subsidy since these funds will be vested in varying percentages subject to the duration of participation in the system in order to encourage longer durations. A participant who stays in the system for less than 3 years will not deserve any state subsidy. In this manner, the percentages for earning state subsidy are between 3-6 years 15%, between 6-10 years 35%, at least 10 years and younger than 56 years 60% and at least 10 years and older than 56 years 100%. The retiree may prefer the retirement savings to be paid back in a lump sum or as regular income.

Finally, for employers, it is possible to sponsor employees' private pension planning via making regular contributions on behalf of them.

At the same time, the employer may settle vesting options included up to 7 years. In other words, employer has right to assign years for

employees to earn the total pension savings gradually. Meanwhile, employers can claim a tax deduction on pension contributions up to 15% of employee income.

Statistically, as of 06.12.2013, there are 4,036,741 participants in the system and the total value of pension funds is 26.2 billion TL. The number of employer-sponsored group pension plans is 263,802.



## Project Spotlight:

### Assessing the Economic Benefits of Marmaray

\*Brief Version

Marmaray, inaugurated in October 2013, connects Asia with Europe for the first time in history, through a railway tunnel under the southern end of the Bosphorus (Istanbul) straits. Part of a larger urban railway line project connecting Asia and Europe in Istanbul, Marmaray is currently considered one of the most ambitious transportation infrastructure projects in the world.

This brief note reports PGlobal's analysis of the economic impact of the Marmaray railway tunnel investment.

#### The Framework

PGlobal's economic analysis consists of identifying and quantifying the economic benefits of Marmaray and gauging these benefits against the investment costs. The results indicate that Marmaray's economic benefits highly justify the investment costs.

#### Quantifying the economic benefits of Marmaray

Even though Marmaray's impacts may be perceived as fairly evident, their quantification is particularly important so as to compare Marmaray's benefits with the public money spent. PGlobal has developed a full-fledged economic impact assessment model in order to examine the following categories of benefits:

- Time savings,
- Reduction in CO<sup>2</sup> emissions,
- Energy,
- Reduction in fatalities.

Identified benefits were subsequently converted into monetary values. The passenger scenarios were developed based on conservative principles.

#### Economic Impact of Marmaray: The Results

**Time savings:** The primary goal of the Marmaray project is help alleviate the transportation burden in Istanbul. The primary benefit of the project is thus considered to be *time savings*.

The model estimates the time savings by projecting the number of passengers who would be diverted from other modes of transportation. That analysis also required assessment of the passenger type and the value of time saved for each category. The results indicated that, indeed, Marmaray would generate a considerable value in time savings: TL 382 million per annum in the best (highest) passenger scenario.

**Energy Savings:** Considering the substantial benefits of mass transport systems in terms of energy expenditures, Marmaray will have a significant positive impact in terms of energy savings. To gain insight into these energy savings,



the fuel consumption of Marmaray was compared with those of the other modes of transportation in use, and the difference between them has been converted into monetary values by multiplying by a conversion factor. Best scenario produces average annual benefits of TL 64 million.

*Our model demonstrates that utilization of Marmaray would result in the elimination of a total of 25,430 car, bus and minibus trips, leading to a significant amount of savings in energy.*

**Environmental Savings:** Road transport accounts for the largest share of total emissions of carbon dioxide (CO<sub>2</sub>) Transport is the only major sector in the EU and Turkey where greenhouse gas emissions are still on the rise. PGlobal calculations indicated that Marmaray may contribute to the reduction of emissions in Istanbul. These benefits are monetized TL 1.9 million TL per annum.

*The model forecast that 5 lives will be saved each year for the next 10 years.*

**Savings in Lives:** There were 15,082 traffic accidents last year in Istanbul resulting in 247 deaths and 268,079 injuries. In addition, a remarkable number of financial losses (1.4 billion TL last year in Turkey), caused by accidents, occur each year.



The average annual value to be derived from fewer accidents over the period of 10 years (between 2014 and 2023) for the best scenario is calculated at TL 52 million.

**Overall Savings from Marmaray Project:** In sum, our economic impact assessment model reveals that Marmaray may generate substantial non-monetary benefits, amounting to TL 387 million per annum.

## FINDINGS AND ASSESSMENTS

Benefits generated by the project comprise monetary revenues (i.e. ticket revenues), in addition to non-monetary (social) ones. Costs, on the other hand, include initial construction, as well as operational costs (maintenance and operational expenses); labor costs are not considered among operational costs as they represent revenues for staff. Construction cost amounts to USD 5.5 billion over nine years, according to publicly available information.

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## About PGlobal

PGlobal is one of Turkey's leading international advisory houses and has completed financial, economic, and management consultancy assignments in Turkey, Turkmenistan, France, Saudi Arabia, N. Cyprus, Bosnia and Herzegovina, Malaysia, and Azerbaijan. PGlobal's team has a combined international experience of over 100 years. PGlobal's experience in event concept design and management includes national and international summits, meetings and training sessions.