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Abstract

This paper analyzes the effects of financial sector deepening on economic growth using a province-level data set for 1996-2001 on Turkey. This period is associated with a weakly regulated and relatively unsupervised expansion of the banking sector which led to the 2001 financial crisis. Contrary to findings in the previous literature, our results indicate a strong negative relationship between financial deepening—both public and private—and economic growth. In light of the developments in the period of analysis, this result is not surprising, as the main function of the banking sector at that time was to provide financing for the Turkish Treasury, which channeled these funds to the government—albeit mainly for rent distribution purposes. However, it is important to note that the growth of private banking sector needs yet to be examined separately, as government ownership of banks may distort the development of the banking sector as a whole. Yet, it is possible to conclude that financial development may not always contribute to economic growth, and the conditions under which such a contribution takes place should be investigated further.

Keywords: Financial sector; Economic growth; Panel data; GMM; Turkey
JEL Classification: G21; O16; O40

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1 Introduction

The link between financial development and economic growth (the "finance-growth nexus") has long received significant attention in economics. This attention is well-justified, since a better understanding of how the financial sector contributes to economic growth has important regulatory implications. Within the finance-growth nexus literature, some have argued that financial intermediaries mobilize, pool and channel domestic savings into productive capital, and by doing so they contribute to economic growth. If this view is to be accepted, then a competitive and well-developed banking sector must be an important contributor to (regional or national) economic growth. In a competitive banking sector, borrowing rates are higher and lending rates are lower, so the transformation of household savings into productive capital investment is faster (Valverde *et al.*, 2003). On the other side of this debate is an argument that financial development is a consequence, and not a cause, of economic growth. In this view, economic growth increases demand for sophisticated financial instruments, which in turn leads to growth in the financial sector.[1]

Over the years, there have been a number of empirical attempts to investigate the link between financial development and economic growth. These studies have dealt with the issue of the direction of causality between financial deepening and economic growth by using instrumental variables. In this strand of literature, the practice is to model economic growth as being dependent on financial sector deepening, and at the same time, taking into account the possibility of bi-directional causality by finding other variables that are thought to affect financial deepening but not economic growth as instruments.

Although most of these studies have found that financial development contributes to economic growth, they have not ended the debate on the direction of causality between economic growth and financial development. This is due to the fact that most studies in this literature have used cross-country data sets. Since legal structures, cultural and economic histories differ between countries, the possibility of omitted variable bias has often

[1]For a comprehensive review of arguments for and against the contribution of financial development to economic growth, please see Levine (2005).

been raised when discussing the results of cross-country studies. Therefore, the more recent studies, such as Levine *et al.* (2000), have used methods that are less susceptible to biases caused by simultaneity, omitted variables and unobserved country-specific effects. For instance, Levine *et al.* (2000) employ instrumental variables, while controlling for the differences in institutions across countries to partially overcome the unobserved heterogeneity due to omitted variables bias. They find that better legal systems provide a more suitable environment for financial sector development, and financial sector development, in turn, leads to higher economic growth. Despite such substantial improvements in the empirical methods used, the issues of causality and omitted variable bias in cross-country studies are not fully resolved and the debate continues.

A potential solution to the omitted variables and unobserved country-specific effects problem is to look at growth within different the regions of a country. Although the homogeneity of institutions and culture within a country possibly reduces the omitted variable bias, the impact of financial growth on regional growth remains relatively uninvestigated in the literature. There exist some studies that have concluded that banking sector development following deregulation has lead to state level economic growth in the U.S. (Clarke, 2002 and Jayaratne and Strahan, 1996).[2] However, differences between the institutional and legal structures among the states still raise the possibility of omitted variable bias. Valverde *et al.* (2003), have investigated the issue of causality between financial development and regional economic growth in Spain and this appears to be only study of its kind looking at a country other than the U.S. Interestingly, Valverde *et. al.* (2003) find that increased competition in the banking sector (which leads to higher deposit and lower loan rates) has not Granger-caused economic growth in Spanish provinces. Their conclusion is that the positive link between financial development and economic growth in cross-country studies may be due to an unobserved third factor.

In light of these developments in the literature, the goal of this study is to investigate the

[2]In an earlier study, Samolyk (1994) looks at the link between credit conditions and regional economic activity in different states of the U.S. She concludes that loan quality of local banks has a direct impact on regional economic performance, but not the other way around.

link between financial sector development and economic growth in Turkey at the province level, for the period 1996-2001. The use of provincial level data reduces unobserved heterogeneity at the cross-section level, since legal environment, institutions and culture across the provinces within a country are much more similar than those across different countries. Moreover, in order to take into account the bi-directional causality between financial deepening and economic growth, instrumental variables approach is utilized, following the recent developments in the literature.

The specific focus of this paper is on the size of the financial sector, or "financial depth", defined as commercial bank deposits divided by GDP. Such a definition of financial intermediary development is very much in line with the traditional view that the financial sector can contribute to economic activity by mobilizing savings and channeling them towards productive capital investment. However, the traditional view implicitly assumes reasonably well-functioning financial intermediaries. The very limited amount of available evidence suggests that the link between financial development and economic growth may be different under adverse financial sector conditions compared to a case of well-functioning financial intermediaries. For example, Samolyk (1994) finds that compared to good credit conditions, low bank loan quality has a greater impact on real income growth in U.S. states.

In this sense, the case of Turkey during 1996-2001 is a perfect test of how the traditional finance-growth nexus theories fare when faced by an inefficient banking sector. Since it is widely agreed that the unregulated and unsustainable expansion of the banking sector during the late 1990s has contributed to the financial crisis of 2001, the link between financial deepening and economic activity in Turkish provinces may not be as straight-forward as implied by traditional views of financial intermediation.

In fact, the results of the study reveal a strongly negative relationship between financial deepening—measured in terms of both public and private banking sector—and growth in real GDP per capita in Turkish provinces. Furthermore, the result appears to be robust to a number of different econometric specifications commonly used in the empirical growth literature. Although this finding contradicts most of the studies discussed above, it is

not very surprising. When one considers that the main function of the Turkish banking sector during the late 1990s was to channel deposits into the Treasury (Denizer *et al.*, 2000), it becomes clear why an increase in financial depth may lead to a slowdown in Real GDP per capita as those funds had mainly been used for rent distribution purposes by the governments. In that sense, this study shows that financial development does not always lead to economic growth and the conditions under which financial deepening occurs are crucially important when contributions of financial intermediaries to economic activity are discussed. It is likely that the somewhat dominant role of state banks in the banking sector during the 1990s differentiate Turkey from other countries that have been studied in the literature (such as Spain or the U.S.). A possible divergence in the effects of private banking sector vs. public banking sector development on economic growth still remains to be investigated, as government ownership of banks may distort the incentives in the banking sector.

It should be noted here that the goal of this study is to investigate the link between financial deepening and short-term economic activity ("short-run economic growth"). The relatively short time-span of the data set (necessitated by data availability), implies that limited conclusions can be reached concerning the link between financial development and long-run economic growth.[3] Nevertheless, the impact of financial development on day-to-day economic activity at a regional level is an understudied topic and this is where the main contributions of this study lie.

The rest of the study is as follows: Section 2 presents a brief overview of the Turkish Banking Sector and explains the features of the financial deepening that took place during the 1990s. Section 3 introduces the data set and the empirical methodology used. The results of the empirical analysis and robustness tests are discussed in Section 4. Finally, Section 5 concludes.

[3]Although the data set covers a significantly shorter time-span compared to the cross-country studies, its time horizon is somewhat more comparable to the few existing studies of financial development and regional growth. Perhaps due to similar issues, data sets used by Valverde *et. al.* (2003) and Samolyk (1994) only cover the periods 1986-1998 and 1983-1990 respectively.

2 Financial Development in Turkey during the 1990s

The roots of the developments in the Turkish banking sector between 1996 and 2001 can be traced back to the financial liberalization program initiated in the early 1980s. Prior to 1980, banks in Turkey was repressed and highly regulated. Almost one-third of banks were state-owned and there were ceilings on both deposit and lending rates. In order to create a more market-based system, the government initiated a liberalization program in 1980, which continued throughout the 1980s.

The late 1980s and the 1990s also witnessed persistently high inflation along with a large and rapidly growing budget deficit. Unable to bring the deficit under control, the Turkish Treasury started to increasingly rely on selling securities to commercial banks. With high net interest margins (NIMs) between borrowing and lending rates, banks favored purchasing government securities over engaging in traditional banking activities. During the 1980s and early 1990s, banks preferred to borrow funds from abroad and lend them to the government. However, in the immediate aftermath of the crisis in 1994, in which the currency was devalued and interest rates shot up, banks found it increasingly difficult to borrow funds from international markets. This made them turn to mobilizing domestic savings in order to raise funds to be lent to the government, although they had reverted back to their previous strategy of borrowing in foreign currency and lending to the Treasury (Damar, 2004).[4]

These developments can clearly be seen in the figures given in Table 1. Along with the number of banks and bank branches, Table 1 also displays three traditional measures of financial deepening for the period 1990-2001. *DEPTH* represents total deposits divided by GDP and *CREDIT* is total loans given out by the banking sector divided by GDP.[5] *BANK-CB* is the ratio of commercial bank assets to commercial bank plus central bank

[4]See Akçay *et al.* (2001), Alper (2001), Alper *et al.* (2001), and Alper and Öniş (2004) for more details on the development of the Turkish banking sector in the late 1990s and the early 2000s.

[5]In the financial development literature, the preferred measure is "Lending to Private Sector" divided by GDP, however, under the Turkish accounting standards of the 1990s, it is impossible to separate loans by recipients.

assets. All three of these financial depth statistics measure the ability of commercial banks to mobilize savings in the economy (Levine, *et al.*, 2000).

The financial depth statistics confirm the attention paid by banks to mobilizing domestic savings after 1994. During the post-1994 period, both *DEPTH* and *BANK-CB* started to increase, along with the number of branches. The increase in branches probably reflects increased competition for domestic deposits, following the reduction in the availability of foreign funds. On the other hand, it is not clear how much of these savings were turned into loans, since *CREDIT* remains fairly stable throughout the 1990s.

The figures in Table 1 reveal the main motivation behind this study. According to four out of five measures, the 1990s were a period of financial development in Turkey. Most of the existing evidence in the literature would then suggest that such a level of financial deepening will have a positive impact on economic growth. However, this period of banking sector growth was followed by an economic crisis in 2001. Although the crisis was triggered by a political row between the Prime Minister and the President in February 2001, most observers agree that it was actually caused by structural weaknesses in the financial sector.[6] The result of the crisis was a devaluation of the currency, failure of a number of banks and a severe contraction in output.

In light of these developments, it becomes very important to establish the link between financial deepening and short-term economic performance. Specifically, the question that needs to be answered is whether the crisis was *caused by* the rapid growth in the financial sector during the 1990s or if it happened *in spite of* the level of financial development that occurred prior to 2001. The answer to this question will make contributions to the financial development - economic growth literature by starting to differentiate between "good financial development" vs. "potentially harmful financial deepening."

[6]See Ardıç and Yüzereroğlu (2006) and the references therein for an overview of the crisis.

3 Data and Methodology

3.1 Methodology

Empirical growth literature has been subject to serious criticisms (see, for example, Brock and Durlauf, 2001). The major questions raised against the literature can be summarized in three parts. First, due to the open-endedness of the theories of growth underlying the empirical literature, a consensus on the potential explanatory variables has not been reached. Second, the majority of the studies in the literature treat countries (or cross-section units) that have intrinsic differences as homogeneous units, using the same regression model for all the cross-section units in the sample. Third, endogeneity is a crucial issue for growth regressions, as the dependent variable and the explanatory variables may indeed have a two-way relationship.

The purpose of this paper is to provide an analysis of the contribution of the developments in the Turkish banking sector to regional economic growth in Turkey. In order to do so, it uses an empirical model that addresses the issues mentioned above, at least partly. Note, however, that in order to account for all these issues, one can use Bayesian techniques proposed by, for example, Brock and Durlauf (2001), Doppelhofer *et al.* (2000), etc. but GMM estimation of a dynamic panel data set was chosen over this alternative.

The reasons for this choice are two-fold. First, this has become a standard practice in analyses of financial deepening and economic growth (see, for example, Levine *et al.*, 2000 and Beck *et al.*, 2000, and Levine, 2005). Second, given the issues on data availability, a dynamic-panel GMM estimation is better suited to meet the particular needs of this study. As described in the next subsection, the data set consists of 81 provinces over a 6-year period. Reliable data at the provincial level is only available for a small number of potential explanatory variables. Thus, even though the open-endedness of growth theories is a criticism of the finance-growth nexus literature in general, this data set contains only a limited number of control variables. Because of this inevitable omission of potential explanatory variables, and because of the concern that the cross-section units may not be homogeneous

regardless, the issue of unobserved heterogeneity arises. The use of fixed effects in a panel setting partially accounts for this, by making it possible to model unobserved heterogeneity. In addition, as this study has a cross-province (as opposed to a cross-country) focus, one would expect that the degree of heterogeneity is not as high. In addition, the endogeneity problem is taken care of by the use of lagged differences of explanatory variables and data on banks' costs and revenues as instruments.

Hence, the rest of this section conforms with the standard practice in the empirical growth literature to develop the model to be used in this paper by first introducing a standard cross-section empirical growth model, and then developing a dynamic panel data model for cross-province growth.

The empirical growth literature models cross-section growth dynamics through an equation of the form:

$$y_{i,t} - y_{i,0} = (\beta - 1)y_{i,0} + \gamma' X_i + \epsilon_i \tag{1}$$

where y is the natural logarithm real GDP per capita, X includes all variables other than the lagged real GDP per capita that are thought to affect the growth process, and ϵ is the error term. In this setting, t is the final time period while 0 denotes the initial time period over which growth dynamics of $i = 1, ..., I$ provinces are analyzed. Each variable in X_i is calculated as the averages over the period of analysis. In the current context, X includes a variable to measure financial deepening, and other variables that are considered to explain growth. Equation (1) is then estimated by OLS. However, as mentioned earlier, such growth regressions have been under attack by various recent studies on several grounds. Hence, besides OLS estimation of equation (1), this paper also uses dynamic panel data methods.

Following the convention, it is possible to write the estimable model in a panel setting as follows:[7]

$$y_{i,t} - y_{i,t-1} = (\beta - 1)y_{i,t-1} + \gamma' X_{i,t} + \eta_i + \epsilon_{i,t} \tag{2}$$

[7]See, for example, Beck *et al.* (2000), Levine *et al.* (2000), Bond *et al.* (2001) and Levine (2005) among others.

where η is an unobserved effect specific to each province i, ϵ is the error term, and the subscript t denotes the time period. The regressors might include period dummies to capture the time-specific effects.

To eliminate the unobserved province-specific effect, the following two-steps are necessary. First, rewrite equation (2) by adding $y_{i,t-1}$ to both sides as:

$$y_{i,t} = \beta y_{i,t-1} + \gamma' X_{i,t} + \eta_i + \epsilon_{i,t} \tag{3}$$

and second, take the first differences of equation (3) to get:

$$\Delta y_{i,t} = \beta \Delta y_{i,t-1} + \gamma' \Delta X_{i,t} + \Delta \epsilon_{i,t} \tag{4}$$

where $\Delta x_t = x_t - x_{t-1}$ denotes the first difference of a variable x.

In the context of empirical growth models, the endogeneity of the regressors is a crucial issue. In addition, once the model is transformed as above so that the unobserved province-specific effect is eliminated, one induces a correlation between the first-differenced error term and the lagged dependent variable in equation (4). Hence, the estimation of such a model by the GMM dynamic panel estimator requires the following moment conditions:

$$E[y_{i,t-s} \Delta \epsilon_{i,t}] = 0 \quad for \quad s \geq 2, \quad t = 3, ..., T \tag{5}$$

$$E[X_{i,t-s} \Delta \epsilon_{i,t}] = 0 \quad for \quad s \geq 2, \quad t = 3, ..., T \tag{6}$$

which basically require that the error term is not serially correlated and the regressors are assumed not to be correlated with the future values of the error term. See Arellano and Bond (1991), and Arellano and Bover (1995) for details.

As shown in Arellano and Bover (1995), and Blundell and Bond (1998), the GMM estimator discussed above has a potential bias attributable to lagged values of the explanatory variables being weak instruments in (4) if the explanatory variables are persistent over time. The solution is to combine (3) with (4) to form a *system*. Then, for equation (3), the

relevant instruments would be the lagged differences of the explanatory variables of that equation itself while for equation (4) the instruments are unchanged, i.e. the lagged values of $X_{i,t}$ and $y_{i,t-1}$. This is possible under the following additional moment conditions:

$$E[\Delta y_{i,t-1}(\eta_i + \epsilon_{i,t})] = 0 \tag{7}$$

$$E[\Delta X_{i,t-1}(\eta_i + \epsilon_{i,t})] = 0 \tag{8}$$

which simply require that the explanatory variables in differences are uncorrelated with the unobserved individual effect.

Thus, combining equations (3) and (4) together with the moment conditions (5), (6), (7) and (8), one can form a GMM estimator that is consistent and efficient. At this point, it is important to note that instrument validity is essential. This is addressed by the use of two tests, which have become a standard practice since put forth by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). One is the Sargan test which tests the validity of the set of instruments with the null hypothesis that the instruments are not correlated with the residuals, and the other is a test for the presence of a second order autocorrelation in the error term. First order autocorrelation is not tested for, as the derivation of the model makes this inherent in the errors.

In order to account for financial deepening and its effects on economic growth during the period 1996-2001 in Turkey, a model of the form (2) - (4) is estimated where the explanatory variables, $X_{i,t}$ include a measure of financial depth, $DEPTH$, along with the conventional variables in the empirical growth literature such as population growth (n), a measure of openness of each province ($OPEN = (Exports + Imports)/GDP$), and two measures of human capital: education, EDU, and health, $Health$. Period dummies are also included to capture any time-specific effects. Besides the cross-section OLS and the dynamic panel GMM methods outlined above, other simple -benchmark- estimatiors such as pooled OLS and within group estimators, which fail to address one or more of the criticisms mentioned at the beginning of this section, are employed as well.

3.2 Data

The data set includes 81 provinces of Turkey between 1996-2001. Some of these provinces were formed during the period of analysis, and hence, the data set is an unbalanced panel.

The dependent variable is the growth rate of real per capita GDP, denoted as g_y, calculated as the first difference of the natural logarithm of per capita real GDP.[8]

The explanatory variables include the lagged value of the real GDP per capita, in natural logarithms (y). Other variables that are thought to affect growth are population growth (n), education (EDU), health ($Health$), and openness ($OPEN$). Annual provincial population growth is calculated using mid-year population estimates. Education measure is constructed using teacher-to-student ratio in each province for each year. Number of hospital beds per 100,000 in each province for each year is used as a proxy for health. Openness measure is the standard one used in the empirical growth literature: it is the ratio of the sum of exports and imports of each province to the GDP of each. Education and health measures are included to control for the effects of human capital on growth. It is expected that the higher values of these two measures imply a larger per capita income growth rate for the province. In addition, it is expected that per capita income growth and population growth are negatively related, as implied by theory. Population growth enters in the growth regression as $POPN = ln(n + g + \delta)$ where g is the rate of technological progress and δ is the rate of depreciation, and $g + \delta = 0.05$ following the convention in the literature.[9] Further, openness measure and per capita income growth are expected to have a positive relationship.[10] The data for these explanatory variables at the province level came from the Turkish Institute of Statistics (TURKSTAT).

The level of financial depth in a province is captured by $DEPTH$, which is total bank

[8]Real GDP per capita at the provincial level is constructed using the production approach to GDP. As production and income in a province may be different at certain instances - for example, the province of Kocaeli is very close to Istanbul and is a center of production activity, while income earners from that production activity mostly live in Istanbul - this may indicate a potential mismeasurement.

[9]This is indicated by the Solow model. See, for example, Mankiw *et al.* (1992) for details.

[10]Due to data unavailability, it was not possible to include a measure of savings at the provincial level.

deposits divided by GDP. A few different measures of financial development are used in the finance-growth nexus literature, but the deposits-to-GDP ratio is the obvious choice for this study. Although there is some province-level loan data available for Turkey, it is not possible to separate out loans by state banks (especially to local governments and state owned enterprises) from the overall lending figures. Since such lending is not generally considered as financial development in the existing literature, using the credits-to-GDP ratio ($CREDIT$ in Table 1) was impractical. Similarly, the commercial bank assets divided by commercial bank and central bank assets ratio ($BANK - CB$ in Table 1) can not be calculated at a province level. This leaves $DEPTH$ as the only possible measure of financial depth that can be used at a province level. Furthermore, using this variable as a measure of financial depth can also help answer the question of whether banks mobilizing savings in the provinces but lending them to the government (instead of local firms) will have a negative impact on regional economic development or not.

As discussed above, lagged values of dependent variables (and their differences) are commonly used as instruments during the GMM estimation. However, it is also possible to use bank level cost and revenue data to construct valid instruments that take into consideration banks' preference towards collecting deposits in low cost, high revenue areas. In order to explore this opportunity, a number of such instruments were constructed and included in the analysis along with the lagged dependent variables. Using individual bank balance sheet data, ratios of interest expense to total deposits, non-interest expense to total deposits, interest revenue to total deposits and non-interest revenue to total deposits were calculated for each bank. Then, the market share of each bank in each province was calculated using the distribution of bank branches within provinces. Finally, a market share weighted average of banks' interest and non-interest costs per \$1 of deposits was calculated for each province. These provide an estimate of interest and non-interest costs of collecting \$1 of deposits in a given province. These two variables are referred to as the "micro-cost instruments." The same process was also repeated for the interest and non-interest revenue ratios in order to calculate the estimated average revenue from collecting \$1 of deposits in a province. These

two variables were then called the "micro-revenue instruments." Bank balance sheet data required for the construction of these instruments was obtained from Banks Association of Turkey (BAT).

Table 2 summarizes the descriptive statistics of the dependent and explanatory variables, and Table 3 summarizes the descriptive statistics for the micro-cost (IE/D for interest and $N - IE/D$ for non-interest costs) and micro-revenue (IR/D for interest and $N - IR/D$ for non-interest revenue) instruments. Table 4 provides the correlation matrix of the data.

4 Empirical Analysis

As mentioned above, the analysis in this paper is done using two different methods: cross-section analysis and dynamic panel data analysis. The findings of each are reported below.

Table 5 displays the results of OLS estimation of equation (1). It is observed that the financial depth variable has a negative coefficient which is significant at 1%, i.e. financial deepening and economic growth are negatively related at the provincial level during the period of analysis. This indicates that when total bank deposits-to-GDP ratio increases by one percentage point, the provincial growth rate declines by approximately eight percentage points. Although this result may seem counterintuitive initially, it is important to reiterate that the period of analysis coincides with the pre-crisis period in Turkey in which the financial sector experienced a somewhat unregulated growth. Hence, this finding supports the claims that the crisis of 2001 was mainly due to the vulnerabilities in the banking sector as a result of this unregulated growth.

In addition to this finding, the rest of the estimation results demonstrate the following. As expected, the initial value of real per capita income, y_{t-1}, has a negative estimated coefficient, significant at 1%. Hence, this is indicative of the existence of diminishing returns over the five-year period. Moreover, the coefficient of population growth is negative and significant at 1%, indicating that provinces with higher population growth tend to have slower growth in terms of real income per capita, confirming expectations. The measures

of education and health are not significant in explaining the growth rate of real per capita income in the context of this cross-section growth analysis. Finally, provinces that trade largely with the rest of the world are likely to experience higher real per capita income growth.[11]

The second part of empirical analysis adopts the dynamic panel data analysis. This is done in three ways: estimating equation (3) via GMM using optimally lagged instruments, estimating equation (4) via GMM using optimally lagged instruments, and estimating a system of equations (3) and (4) via GMM using optimally lagged instruments.[12] This set of three estimations are performed for different instrument sets: one including only the relevant lags of the explanatory variables, and others including the relevant lags of the different combinations microcost and microrevenue variables along with the relevant lags of the explanatory variables.

Tables 6 and 7 summarize the results.[13] Table 6 reports the summary results for the financial depth variable only. As including different combinations of microcost and microrevenue variables among the instruments did not alter the results, only the estimates using the relevant lags of *non-interest expense for a $1 of deposits* ($N - IE/D$) as additional instruments are presented. As can be observed from Table 6, financial deepening and growth are significantly and negatively related over the period of analysis, confirming the findings of the cross-section analysis.

Table 7 presents the full estimation for results of the system estimators using the relevant lags of explanatory variables as instruments, labeled in the table as [1], and the

[11] In cross-section estimation, explanatory variables, except the lagged value of real per capita income, are constructed by calculating the averages of each variable for each province over the entire period of analysis. As indicated above, the data set includes 81 provinces, however, some of these provinces were established during the period of analysis and thus have shorter data. In the panel setting, the data set is an unbalanced panel, however, in the cross-section setting, those provinces with shorter data span were left out of the estimation, and hence, the number of included observations is 76.

[12] Although the first estimation is not relevant for growth, as it is used in forming the system estimator of the third, it is performed for comparison purposes.

[13] The dynamic panel GMM estimations are performed using Arellano and Bond's DPD98 procedure for Gauss. Full estimation results are not reported for space considerations. They are available from the authors.

relevant lags of the microcost variable as additional instruments, labeled in the table as [2].[14] As before, since the estimation results using the relevant lags of different combinations of microcost and microrevenue instruments produce similar outcomes, only those with *non-interest expense for a $1 of deposits* are presented. The results indicate that openness indicator is significantly and positively related to economic growth, as expected. In addition, when the microcost variable is added as an additional instrument, health becomes positively significant as well. Population growth and education are insignificant as determinants of provincial growth. Furthermore, it is possible to note that years 1999 and 2001 have significant negative effects on real per capita provincial income growth while the year 2000 has a significant and positive impact. As 1999 corresponds to a relative slowdown in the economy as a whole, 2000 is when there is a slight recovery and 2001 corresponds to the year in the aftermath of the crisis, such time dummy effects are expected.

Since Table 7 reports the estimation results for equations (3) and (4), the coefficient estimate of y_{t-1} is the estimate of β. One would expect, in the presence of diminishing returns, that initial real per capita income and the growth rate of real per capita income to be negatively related, as in equation (2). Hence, $\beta - 1$ would give us this relation, as estimates of β are between 0 and 1. In fact, the convergence coefficient implied by [1] and [2] are 6.30% and 3.88% annually, indicating that there exists positive convergence among the provinces in terms of real per capita income during the period of analysis.[15] Since the empirical model includes control variables other than the lagged value of the real per capita income, these results are evidence for the existence of conditional convergence. Other studies that find evidence for conditional convergence in the Turkish context include Filiztekin (1998), and Doğruel and Doğruel (2003).

The system GMM estimates satisfy the specification tests. Table 7 reports the results

[14]For system estimators, one-step estimates are reported as two-step estimates have downward biased standard errors. See Blundell and Bond (1998) or Bond et al. (2001). The standard errors of one-step estimates are also asymptotically robust to heteroskedasticity.

[15]The convergence coefficient implied by the cross-section analysis above is 3.08%. For more on the derivation of the convergence coefficient see Mankiw *et al.* (1992) which is the pioneering work on the empirical applications of the Solow growth model.

of five tests: Wald test for the joint significance of coefficients, Wald test for the joint significance of time dummies, Sargan test, and second order autocorrelation tests. Since the model is first differenced, it is natural to have first order serial correlation in the errors, however, one would like to have no second order serial correlation. As can be observed from the results, the null hypothesis of no second order serial correlation cannot be rejected at any conventional significance levels. Moreover, the findings also indicate that the coefficients and the time dummies are jointly significant. Sargan test is a test for the validity of the instruments. The null hypothesis is that the instruments used are not correlated with the error terms. According to our results, this null hypothesis cannot be rejected at any conventional significance levels either.

The relationship between financial deepening an growth in the data set is further investigated using pooled OLS and within groups estimators. These methods ignore the issue of endogeneity. In addition, pooled OLS also dispenses with the unobserved heterogeneity dimension. Nevertheless, the estimation of such models is done as a benchmark for comparison purposes. The findings indicate that the negative relationship between financial deepening and economic growth prevails using these methods as well.[16]

5 Concluding Remarks

This study looked at the link between financial development and economic growth in the provinces of Turkey. Using both traditional OLS and dynamic panel GMM techniques, it was shown that financial deepening (i.e. an increase in the total deposits to GDP ratio) has a direct and robust impact on the growth rate of real GDP per capita. However, unlike most of the cross-country studies in this literature, the findings suggest that financial development has a negative relationship to economic growth. Although this conclusion may be puzzling upon first glance, it does fit rather well with the state of the Turkish economy and banking sector during the late 1990s. Unlike the traditional theories of financial intermediation, the

[16]The estimation results of these models are not reported for space considerations. They are available from the authors upon request.

Turkish banking sector during this period was not mobilizing and pooling domestic savings in order to invest in productive capital. Instead, the sector was engaged in channeling domestic resources to the government, which used the funds to cover its budget deficit. This is a much different situation compared to the U.S. (studied by Jayaratne and Strahan, 1996 and Clarke, 2004) or Spain (Valverde, *et al.*, 2003) during the 1980s and the 1990s.

When one considers what happened in Turkey during 1996-2001, it becomes clear that the findings of this study are not directly contrary to the existing studies in the literature. This study confirms the very important link between financial development and growth, but also sounds a note of caution that not all types of financial deepening is beneficial for the economy. In the case of Turkey, financial deepening meant that savings left the provinces, depriving the real industry of credit needed for investment projects. As such, it may not be hard to imagine that if the banking sector was functioning efficiently during this period, then financial deepening may have contributed to economic growth in the provinces, as opposed to taking them into a serious crisis.

At this point, it is important to note that financial deepening is measured in terms of the growth of both the public and the private banks. As is well-documented in the literature, government ownership of banks may distort incentives leading to an underdevelopment of the banking sector.[17] Therefore, financial sector deepening in terms of the public and private banks could be analyzed separately before making firm conclusions about the negative relationship between financial growth and economic growth.

There are a number of other remaining issues that require attention from future studies. The unavailability of data has forced this study to concentrate on the impact of financial development to short-term economic fluctuations. A similar dynamic panel analysis with a longer horizon is undoubtedly necessary. Also, an inclusion of additional variables, in order to account for economic and cultural variations between different provinces (however small these may be) can also improve the reliability of the results.

[17]See, for example, La Porta *et al.* 2002. Although there are major differences between state and private banks, it appears that lending to the government was equally important for both groups. During 1996-2001 the average Securities to Total Assets ratio was 14.58% for private banks and 10.10% for state banks.

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Year	*Banks*	*Branches*	*DEPTH*	*CREDIT*	*BANK-CB*
1990	64	5549	0.2420	0.1411	0.7350
1991	63	6162	0.2639	0.1666	0.7531
1992	69	6323	0.2794	0.1945	0.7575
1993	70	6324	0.2749	0.2191	0.7857
1994	67	6235	0.3296	0.2049	0.7444
1995	68	6383	0.3433	0.1950	0.7428
1996	69	6618	0.4160	0.2208	0.7692
1997	72	7064	0.4350	0.2249	0.8047
1998	75	7574	0.4630	0.4157	0.8425
1999	81	7909	0.6234	0.1824	0.8470
2000	79	8078	0.5493	0.2342	0.8605
2001	61	7178	0.6538	0.2078	0.7379

Table 1: Financial Development measures in Turkey for the period 1990-2001. *DEPTH* is given by "Total Deposits/GDP", *CREDIT* is "Total Loans/GDP" and BANK-CB is "Commercial Bank Assets/(Commercial Bank + Central Bank Assets)"

	g_y	y_t	y_{t-1}	*DEPTH*	*POPN*	*EDU*	*Health*	*OPEN*
Mean	0.0262	8.4446	8.4185	-1.7855	-2.8632	-3.2054	5.1382	0.0917
Median	0.0269	8.4899	8.4636	-1.7482	-2.8154	-3.1615	5.1761	0.0470
Maximum	0.6983	9.7763	9.7707	0.1754	-2.3799	-2.6340	6.4520	0.8245
Minimum	-0.2496	7.2034	7.1929	-3.2180	-4.2434	-4.1359	3.7842	0.0000
Std. Dev.	0.1112	0.4752	0.4821	0.5822	0.2924	0.2596	0.5143	0.1265

Table 2: Descriptive Statistics. Dependent and Explanatory Variables. Variables in natural logarithms, except for growth rates which are log differences. g_y denotes growth rate of real per capita income, y is real per capita income, *DEPTH* and *POPN* are financial depth and population growth, respectively. Education indicator, *EDU*, is student-to-teacher ratio, *Health* indicator is number of hospital beds per 100,000, and openness indicator, *OPEN*, is exports plus imports-to-GDP.

	IE/D	*N-IE/D*	*IR/D*	*N-IR/D*
Mean	0.3182	0.0747	0.4210	0.0092
Median	0.3093	0.0738	0.4023	0.0169
Maximum	0.5450	0.1254	0.7919	0.0596
Minimum	0.1956	0.0460	0.2708	-0.0768
Std. Dev.	0.0738	0.0138	0.1100	0.0308

Table 3: Descriptive Statistics. Potential Instruments. *IE/D* and *N-E/D* are the estimated interest and non-interest costs of collecting a \$1 of deposits in a province, respectively. *IR/D* and *N-IR/D* are interest and non-interest revenues earned from collecting \$1 in deposits in a province.

	g_y	y_t	y_{t-1}	*DEPTH*	*POPN*	*EDU*	*Health*	*OPEN*	*IE/D*	*N-IE/D*	*IR/D*	*N-IR/D*
g_y	1											
y_t	0.0546	1										
y_{t-1}	-0.1769	0.9731	1									
FD	-0.2049	0.3559	0.3981	1								
POPN	-0.0154	0.0556	0.0584	-0.1682	1							
EDU	0.0054	0.4215	0.4142	0.3879	-0.4208	1						
Health	-0.0132	0.5342	0.5296	0.4888	-0.2190	0.5291	1					
OPEN	-0.0445	0.4393	0.4433	0.4478	0.3064	-0.1960	0.2358	1				
IE/D	-0.4292	-0.2349	-0.1325	-0.0104	-0.1991	0.0257	-0.0324	-0.2356	1			
N-IE/D	-0.1757	0.2205	0.2579	0.3053	0.0399	-0.0093	0.1288	0.2499	-0.0109	1		
IR/D	-0.4542	-0.1459	-0.0390	0.0744	-0.1598	0.0013	0.0017	-0.1072	0.9472	0.2031	1	
N-IR/D	0.3850	0.0497	-0.0399	-0.1535	0.1247	0.0386	-0.0469	-0.0053	-0.6954	-0.4493	-0.8437	1

Table 4: Correlation Matrix. The variable definitions are provided in the notes for Tables 2 and 3.

Constant	0.1632	(0.9891)
y_{t-1}	-0.1400*	(0.0542)
$DEPTH$	-0.0798*	(0.0343)
n	-0.1495*	(0.0682)
EDU	0.0088	(0.1176)
$Health$	0.0978	(0.0703)
$OPEN$	0.3533***	(0.2093)
S.E.E.	0.1276	
$\bar{R}^2$	0.1806	
No. Obs.	76	

Table 5: Financial deepening and growth: cross-sectional OLS estimation of equation (1). Standard errors are in parentheses. *, **, and *** show that the coefficient estimate is significant at 1%, 5% and 10%, respectively.

	[1]	[2]
Levels	-0.0116*	-0.0123*
	(0.0009)	(0.0010)
First Differences	-0.1250*	-0.1289*
	(0.0057)	(0.0059)
System	-0.1255*	-0.1247*
	(0.0229)	(0.0205)

Table 6: Financial deepening and growth: summary of dynamic panel analysis. Levels correspond to equation (3), first differences correspond to equation (4) and system corresponds to a system of these two equations. Model [1] uses optimally lagged first differences of the explanatory variables as instruments while model [2] has optimally lagged values of the microcost variable *non-interest expenses-to-deposits* ratio as well. Standard errors are in parentheses. *, **, and *** show that the coefficient estimate is significant at 1%, 5% and 10%, respectively.

		[1]	[2]
Constant		2.0028**	0.7812
		(0.8730)	(0.8509)
y_{t-1}		0.7299*	0.8238*
		(0.0551)	(0.0496)
$DEPTH$		-0.1255*	-0.1247*
		(0.0229)	(0.0205)
n		0.0322	0.0259
		(0.0563)	(0.0617)
EDU		0.1668	0.0985
		(0.1233)	(0.1214)
$Health$		0.1082	0.1493**
		(0.0687)	(0.0655)
$OPEN$		0.7493*	0.6642*
		(0.2087)	(0.1871)
t: 1998		0.0070	-0.0022
		(0.0141)	(0.0146)
t: 1999		-0.0939*	-0.1107*
		(0.0189)	(0.0191)
t: 2000		0.0240	0.0093
		(0.0210)	(0.0219)
t: 2001		-0.2064*	-0.2239*
		(0.0189)	(0.0206)
1st order	test stat	-3.4180	-3.5210
serial	df	76	76
correlation	p value	0.0010	0.0000
2nd order	test stat	0.7230	0.6590
serial	df	76	76
correlation	p value	0.4700	0.5100
Wald Test	test stat	428.2198	1001.4208
Joint	df	6	6
Significance	p value	0.0000	0.0000
Wald Test	test stat	161.5901	177.7577
Time Dummy	df	4	4
Joint Sig.	p value	0.0000	0.0000
Sargan Test	test stat	70.7944	68.6798
	df	97	115
	p value	0.9790	1.0000

Table 7: Financial deepening and growth: results of dynamic panel analysis - system GMM. (The system of two equations (3) and (4). Model [1] uses optimally lagged first differences of the explanatory variables as instruments while model [2] has optimally lagged values of the microcost variable *non-interest expenses-to-deposits* ratio as well. Standard errors are in parentheses. *, **, and *** show that the coefficient estimate is significant at 1%, 5% and 10%, respectively.