

IMPACT OF ECONOMIC AND DEMOGRAPHIC CHANGES ON LONG RUN SAVINGS RATES IN DEVELOPING ASIA

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Abstract: *In this paper, the objective was to understand and analyze the factors, over and above economic growth, that have played a role in explaining the differences in savings rate across countries in developing Asian countries. This paper focuses specifically on the impact of certain demographic realities of the region such as a rapidly changing gender composition of the labor force in addition to a rapidly aging population along with the economic reality of widespread economic growth on the savings rate of countries in the sample. We find that both economic growth and changes in the gender composition of the labor force have had a significant positive impact on saving rates in developing Asia but the magnitude of the impact of the changing gender composition of the labor force has remained relatively small. This may be related to the relative gender disparity in the formal work force as well as an outcome of female laborers being primarily employed in lesser paying jobs. The results also indicate that the rapid increase in the age dependency rate has had a significant negative impact on the savings rates.*

JEL Classifications: O10, J16, J21, E21

Keywords: Long Run Savings, demographic changes, Asia, female labor force participation

I. INTRODUCTION

The last few decades have seen generally rising domestic savings rates in Asia with substantial differences across countries. At the same time, the last few decades have also witnessed mostly high growth rates in Asia though the growth rates have not been uniform across all countries. It is important to understand whether these two phenomena are correlated. Theory and research predict that savings drive investment, which in turn, drives economic growth. However, an argument can also be made that economic growth leads to higher savings. Higher growth usually leads to growth in personal income, which leads to higher savings. In reality there is perhaps a bi-directional relationship between growth and savings. In this paper, the objective is to understand and analyze the factors, over and above economic growth, that have played a role in explaining the differences in savings rate across countries in developing Asian countries.

The countries in our sample include Bangladesh, China, Hong Kong China, India, Indonesia, Korea, Malaysia, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, and Vietnam

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and cover a more recent time period from 1991 to 2009. This paper focuses specifically on the impact of certain demographic realities of the region such as a rapidly changing gender composition of the labor force (increase in the relative proportion of females to males) in addition to a rapidly aging population along with the economic reality of widespread economic growth on the savings rate of countries in the sample. Economic growth and aging population have received much attention in the savings literature but the impact of changes in the gender composition of the work force on savings is relatively new and has received relatively less attention. In this paper it is being hypothesized that economic growth and the increase in the relative proportion of females to males in the labor force has had a positive impact on savings while the growth in the aging population has had a dampening impact on the savings rate. Our hypotheses imply that the differences in savings rates observed across the countries in our sample are a result of the net impact of these opposing forces at work.

The first hypothesis is that the increase of the relative proportion of females to males in the labor force would have a positive impact on the savings rate. The research of gender differences in financial behavior between men and women finds women to be generally more risk averse than men. What this implies is that women will be more likely to have more precautionary savings and invest their savings more conservatively than men and probably have less wealth as a result. Less wealth may also lead to lesser spending and more savings by women. Basically, resources under the control of women would be more likely to be saved and invested for retirement than resources in the hands of men (Rubalcava, Teruel, and Thomas, 2004). The literature relating specifically to the impact of gender on savings in developed countries is very limited. This could be because the gender composition of the labor force in developed countries has been fairly high and consistent.¹ In addition, both men and women in developed countries have access to state-provided retirement earnings, which reduces the urgency for retirement savings. Of the literature that does exist the results contradict each other and the ultimate impact of gender on savings seems to be ambiguous (Sunden and Surette, 1998; Agnew and Szykman, 2005; Fisher, 2010).

For developing countries too, there has been relatively limited work done on gender and savings behavior. However, unlike developed countries, the entry of women into the formal labor force is a relatively recent phenomenon for developing countries especially in Asia given its tradition of gender inequality in the work force. Of the studies that exist for developing countries, the evidence shows that women have a higher propensity to save. The explanation about the risk-averse nature of women explains partly why women would have a higher propensity to save. In addition, cultural norms in developing countries along with the absence of any state-provided provision for retirement income add to why women in developing countries have a higher propensity to save. Moreover, we need to remember that more women entering the formal labor force implies greater household disposable income, which is also going to have a positive impact on household and aggregate savings. Based on these factors, we hypothesize that the changing gender composition of the labor force in developing Asian countries is going to have a positive impact on the savings rate.

The second hypothesis relates to the negative impact of the increase in the age dependency ratio of the population on savings in developing Asia. Population aging is a worldwide phenomenon but it reached developed countries well before reaching developing countries due

to countries being in different phases of demographic transition. As a result, developed countries have been dealing with an aging population for much longer while it is a relatively new phenomenon for developing countries. In developed countries the aging population receives financial support from the state via some form of social security. In a pay-as-you-go system, this means that a growing aging population imposes a greater burden on the working population without necessarily impacting aggregate national savings. This weak impact of aging on savings in developed countries is supported by empirical research (Elmendorf and Sheiner, 2000).

In developing countries however the aged population does not have the financial security or safety net of state-provided provisions commonly found in developed countries. The aging population in developing countries mainly supports itself by drawing down on their own savings (Horioka and Terada-Hagiwara, 2011) or via transfers within the extended family system (Weil, 2008). If the aged were financed primarily by their children and extended families then the knowledge of having to support elderly parents and relatives may increase savings by the younger generation. However, if we assume that the aged in developing countries primarily financing themselves by drawing on their own past savings, then aging would have a negative impact on savings. The ultimate impact of aging on the savings rate would be an outcome of the two opposing influences. The empirical literature appears to support that the net impact of aging on savings in developing countries to be negative (Park and Shin, 2009; Horioka and Terada-Hagiwara, 2011). Given the theory and existing research especially with reference to developing countries, we hypothesize that the growing age-dependency of the population in developing Asia would have a negative impact on long run savings.

Our final hypothesis relates to the positive impact of economic growth on savings. The positive impact of economic growth on savings has been established as one of the predictions of the life cycle theory of savings and well established in the empirical literature. Loayza, Schmidt-Hebbel, and Servén (2000) use a panel instrumental variable approach (to account for the possible reverse causality between growth and savings) to estimate the effect of income growth on saving. They find a 1 percentage-point rise in the growth rate to increase private savings rate by a similar amount. In addition, Loayza, Schmidt-Hebbel, and Servén (2000) find the impact of economic growth on savings to be much stronger for developing countries relative to developed countries. Given the theoretical and empirical support for the link between economic growth and savings, we hypothesize here that the generally rising economic growth in developing Asia over the last few decades would have had a positive impact on long run savings.

The results of our empirical research support the hypotheses put forward in this paper. We find that economic growth and lagged economic growth are found to have a significant positive impact on the savings rate. Changes in the gender composition of the labor force (increase in female to male employment ration of the working-age population that actively engages in the labor market) has also had a statistically significant positive impact on saving rates in developing Asia. However the magnitude of the impact is relatively small. This could be because the female to male proportion in the labor force is relatively small and has not grown much in the twenty years under consideration for this analysis. Additionally, female employment has mainly grown in this region in recent decades following the demand for low-wage workers in export-oriented manufacturing, a phenomenon more specific to some sub-regions and countries within Asia (ILO, 2011). The results also indicate that the rapid increase in the age dependency rate has had

a significant negative impact on the savings rates. Dynamic analysis results imply that the initial impact of a changing gender composition of the labor force on the savings rate is negative but it turns positive after a one period lag. What this implies is that perhaps for developing countries an initial increase in the relative proportion of females to males in the labor force leads to increases in consumption spending as income levels rise (wealth effect) but that over time this effect is overcome and we find the savings rates increase. GDP growth is also found to have a statistically significant impact in the dynamic model though lagged GDP growth is no longer significant. The age dependency ratio or its lagged variable is not found to remain statistically significant in the dynamic model.

The rest of the paper is organized as follows. Section II provides a brief review of the empirical literature on this topic. In Section III we discuss the data and empirical model. In Section IV we discuss and analyze results of the empirical model discussed in Section III as well as an alternative dynamic model that we introduce in this section. Section V is the concluding section.

II. BRIEF LITERATURE REVIEW

There are several theories of savings behavior in the literature. The existing theoretical literature is unclear about both the direction of causality between the savings rate and income or growth and about whether the association between savings and growth should be positive or negative. Theories, such as the permanent income and life cycle hypotheses, imply that people choose their consumption (and savings) levels depending on current and (expected) future income levels. These theories imply a positive relation between savings and income growth. Modigliani (1970) argues that if there was no income growth and no population growth across generations, the aggregate savings rate would be zero as the savings of the young would exactly balance the dis-saving of the old. However if one expects income growth to make the young save more than how much the old dis-save then there would be a positive association between savings and growth. However, Carroll and Weil (1994) have argued that, *ceteris paribus*, the wealth effect from an exogenous increase in the aggregate growth will make consumers consume more and save less thus implying that the impact of income growth on savings could be negative. On the other hand, if consumption patterns are more resistant to change, a larger fraction of increases in income may be saved resulting in the savings rate increasing with income increases. The buffer stock model of savings (Deaton, 1991; Carroll, 1992) also yields a similar relation between savings and growth. Bosworth and Chodorow-Reich (2007) empirically test the relationship between economic growth and savings for a panel of 85 countries from 1960 to 2005 and find that both current GDP growth and past year's GDP growth to have a significant positive impact on savings in industrial countries as well as for countries in Asia but not so for Latin American countries.

In order to establish the hypothesis relating to the positive impact of the increase in female relative to males in the labor force on savings, we begin by looking into the financial literature on gender differences in risk taking behavior. There is considerable empirical evidence suggesting that women are more risk averse than men. For example, Sunden and Surette (1998) and Bajtelsmit, Bernasek and Jianakoplos (1999) and Jianakoplos and Bernasek (1998) provide evidence supporting a greater degree of risk aversion among women.² This implies that

precautionary savings will be higher for women. In addition, women will be more likely to invest in less risky assets which might lead to women being less wealthy. Less wealth implies a higher propensity to save for women as they would be less likely to experience the positive wealth effect on spending which reduces savings. To this one can add that women typically have lower working-life incomes than men and they typically live longer than men implying that women would save at higher rates compared to men (Browning, 2000; Floro and Segino, 2004). This would imply that as more women enter the labor force and earn an income, we should see an increase in overall household savings.

Very little research exists looking particularly at the savings behaviors of men versus women in developed countries. One possible reason for that could be because the gender composition of the labor force in developed countries has been fairly uniform and equitable for several decades. Thus, it is difficult to study the marginal impact of more women entering the work force. Of the research that does exist, the implications appear to be unclear. For example, Sunden and Surette (1998) found that women are less likely to have a defined contribution retirement savings plan but Agnew and Szykman (2005) found the opposite. Fisher (2010), who studied differences in savings behavior of men and women in the United States found that while the proportion of men and women reporting that they save regularly was similar, women were less likely than men to have saved the previous year. Interestingly enough, women in this sample, who reported low risk tolerance, were significantly less likely to save over the short term as well as to be regular savers.

The evidence for developing countries appears to support that greater female participation in the labor force would increase savings (Chowa, 2006; Fafchamps & Quisumbing, 2005; LeBeau, Iiping, & Conteh, 2004; Floro and Segino, 2004). For example, Floro and Segino (2004) show that women's access to outside income is likely to raise the aggregate saving rate of a country. These results provide evidence of women's propensity to save being higher than that of men's at least for developing countries. The reason for the higher propensity to save could be greater risk-averse nature of women living in mostly patriarchal societies where often there is no other fall-back retirement savings provided by the state. In addition, one finds that cultural norms prevalent in developing countries can explain why women save more (compared to men) in developing countries. These include saving to pay for a dowry and/or to finance siblings' education expenses (Kim, 1997); saving to help the family to finance the son's education (Greenhalgh, 1985); saving to help with household expenses during times of distress and for financing wedding expenditures (Wolf, 1988), to name a few. In addition, Deaton and Paxson (1977) have argued that child rearing also has an impact of women's savings though the direction of impact is not clear. While greater altruism may lead to greater savings by women, seeing children as old-age financial support may reduce savings, making the ultimate impact of child rearing on savings to be unclear.

One other way that having more women in the work force may increase savings is via increased household disposable income. This impact of increase in income on savings in developing countries is found in Loayza, Schmidt-Hebbel and Serven (2000) which shows that the influence of income typically is greater in developing than in industrial countries, tapering off at medium or high income levels. They find that in developing countries a doubling of income per capita is estimated, other things being equal, to raise the long-run private saving

rate by 10 percentage points of disposable income. Dynan, Skinner, and Hernandez (2000) also find support for the positive relation between income and savings and find that richer people do indeed save more.³

In terms of the impact of aging on savings, the impact is expected to vary between developed and developing countries. In developed countries, the aging population typically has recourse to some form of social security. This implies that under a pay-as-you-go system where the current working population supports the retired population through taxation, demographic transition increases the size of the public pension, which may have a fiscal impact via increased taxes but not necessarily a direct impact on capital formation or savings. This is supported by the work of Elmendorf and Sheiner (2000) who find that the current aging forecasts for the United States does not provide a rationale for large increases or decreases in current saving. In other words, in developed countries, an aging population mostly imposes a burden on the working population but aggregate savings are mostly unaffected. Bloom, Canning and Fink (2010) also find that OECD countries will experience only perhaps a modest decline in growth due to aging.

The impact of aging on aggregate savings is expected to be mostly negative for developing countries since the aged typically finance their retirement by drawing down their own past savings or via transfers from extended family. Bloom, Canning and Fink (2010) find aging to have a negative impact on economic growth in non-OECD countries though they do not find this impact to be very significant. Based on their conclusions we can predict that the resulting impact on the savings rate (via economic growth) would be negative as well. Horioka and Terada-Hagiwara (2011) find a much stronger negative impact of aging on savings. They study the determinants of savings in developing Asia from 1966-2007 and conclude that the age-dependency ratio has had a negative impact on long run savings in these countries. Similar results are confirmed by Park and Shin (2009) and Loayza, Schmidt-Hebbel, and Servén (2000).

III. DATA AND EMPIRICAL MODEL

In developing the model the empirical model will concentrate on the research questions and also rely on the existing literature on this topic. The dependent variable in the empirical analysis is the real domestic savings rate. Real domestic saving rates are constructed using a standard procedure of subtracting private consumption and government shares of real GDP from 1 and are taken from the Penn World Tables version 7.0 (Heston *et al.*, 2011). A close inspection of the data shows that in general South Asian countries have lower saving rates as compared to East and Southeast Asian countries. Among the Southeast Asian countries Thailand and Philippines have relatively lower rates of saving. In addition, Malaysia and Thailand appear to have experienced a slowing of their savings rates since the early 2000s. Over time the real domestic savings rate for the overall sample has grown from 26.073 in 1991 to 30.66 in 2009.

In this paper the changing gender composition of the work force is measured by the relative proportion of females to males of the working-age population (ages 15–64) that actively engage in the labor market, by either working or actively looking for work. Henceforth this will be referred to as the relative gender employment proportion (*RGEP*). Data for this variable is utilized from the United Nations' International Human Development Indicators. In our sample

we find that the *RGEP* rose from about .6 in 1991 to .66 by 2009, which is still way below the average gender employment ratios for developed countries which range around .8 and above and generally show an increasing trend. It needs to be noted however that even though Asian women have fared better than their male counterparts in the labor force in recent years a large gender gap continues to exist in employment and by occupation. The data show that the *RGEP* has remained mostly steady with an increasing trend for some of the countries. However, South Asian countries such as India, Pakistan, and Sri Lanka have markedly lower *RGEP* levels and growth rates compared to the rest of the sample.

The other two variables of interest for this paper are the age dependency ratio and economic growth. The age dependency ratio in this analysis is measured as the proportion of the population over 65 has received the most attention in the literature on savings as it pertains to developing countries especially in Asia. Most of the countries in the sample are at phases in their economic development where birth rates have steadied or diminished while death rates have slowed down remarkably. Thus, some of the pertinent demographic characteristics of the countries in the sample include changing trends in life expectancy and population aging. Related to life expectancy and aging, are changing trends in the age dependency ratios and the youth dependency ratios. Bloom *et al.*, (2003) show that under plausible assumptions, increases in longevity lead to higher savings rates. However, these higher savings rates are offset by increased old age dependency. The authors claim that these results explain the boom in savings in East Asia during 1950-90 as a combination of rising life expectancy and falling youth dependency. A closer look at the age dependency rates for individual countries shows that this variable is increasing for all of the countries in the sample, but the increase is most pronounced for China, Hong Kong, Korea, Singapore, and Thailand. Over time, the overall age dependency ratio has grown from about 5% in 1979 to about 7% of the population in 2009.

The third variable of interest is economic growth measured as the rate of growth of per capita GDP. There is also empirical literature supporting a positive relationship between economic growth and savings (Carrol and Weil, 1994). In our sample we find China to have experienced the highest average economic growth rate of around 10% over the time period under consideration followed by Singapore (7.01%). In general the data show that the Southeast Asian countries experienced higher growth rates compared to the South Asian countries with the exception of India, which experienced consistently high growth rates since 2003.

Over and above the variables of interest, we also include other variables which have been shown in the literature to have an impact on the savings rate. One group of explanatory variable falls under the category of demographic variables. These include the age dependency ratio and the youth dependency ratio. Age dependency ratio has already been discussed above. Youth dependency ratio is measured as the proportion of the population aged fourteen or younger. This particular variable exhibits a diminishing trend for all countries in the sample. Over time, one finds this variable has dropped dramatically with the proportion being at about 34% in 1991 and dropping to about 26% in 2009. Loayza *et al.*, (2000) show that a rise in youth dependency rate of about 3.5 percentage points results in about a 1 percentage point decline in savings while the impact of an increase in old age dependency rate on savings is about twice as large. Both the age dependency ratio and the youth dependency ratio are taken from the World Bank's World Development Indicators.

A second category of explanatory variables relate to the financial sector which has experienced some sweeping changes in the past two decades. Evidence suggests that financial incentives, such as high interest rates on savings and time deposits along with financial liberalization, which relaxed financial constraints and eased access to credit, are presumed to have had a positive impact on the saving rate by making savings more lucrative. At the same time an increased demand for credit pushed up interest rates (Horioka and Terada-Hagiwara, 2011).

In order to account for the financial sector we include domestic credit provided by the banking sector as a percentage of GDP. This variable includes all credit to various sectors on a gross basis, with the exception of credit to the central government, which is net. The banking sector includes monetary authorities and deposit money banks, as well as other banking institutions where data are available (including institutions that do not accept transferable deposits but do incur such liabilities as time and savings deposits). Examples of other banking institutions are savings and mortgage loan institutions and building and loan associations. Over and above domestic credit, we also include the real interest rate as an explanatory variable. The impact of real interest rate is ambiguous since its impact will depend on the relative strength of the income and substitution effects (Gupta, 1987). Data on domestic credit and the real interest rate are from the World Bank's World Development Indicators.

In addition to the above, we control for the effects of income and economic uncertainty measured via inflation. There are several studies that show there is a positive relationship between real per capita income and savings rate (Collins, 1991; Carroll and Weil, 1994; Loayza *et al.*, 2000). Additionally, Bosworth and Chodorow-Reich (2007) and Park and Shin (2009) find that over and above real per capita income the lagged real capita income has a positive impact on the savings rate. In terms of the impact of uncertainty on savings the theory predicts that an increase in uncertainty would increase precautionary savings. Using inflation as a proxy for uncertainty, Loayza *et al.* (2000) find that uncertainty has a positive impact on the private savings rate. Data for per capita real GDP, growth rate of per capita GDP and the GDP deflator are all from the World Bank's World Development Indicators data base.

The empirical model also tests for the existence of a non-linear impact of income and the financial market on savings rate. Park and Shin (2009) find the relationship between income and savings to be non-linear and convex with reference to Asia. Additionally, Wang, Xu and Xu (2011) find that the financial sector development has a non-linear impact on savings if there is friction in the financial market and if development in the financial sector reaches firms before it reaches households. Horioka and Terada-Hagiwara (2011) include quadratic expressions of both the natural log of real per capita GDP and credit to test for the existence of this non-linear relationship between these two variables and the real savings rate. Their results confirm the existence of this non-linear relationship.

After utilizing all the above information the reduced form estimating equation that is utilized for the analysis is given by:

$$RSR_{i,t} = \alpha_0 + \alpha_1 RGEP_{i,t} + \alpha_2 AgeDep_{i,t} + \alpha_3 YouthDep_{i,t} + \alpha_4 LnGDP_{i,t} + \alpha_5 LnGDPSQ_{i,t} + \alpha_6 Credit_{i,t} + \alpha_7 CreditSQ_{i,t} + \alpha_8 X_{i,t} + u_{i,t} \quad (1)$$

where $i = 1, \dots, 14$ (1=Bangladesh, 2=China, 3=Hong Kong China, 4= India, 5=Indonesia, 6=Korea, 7=Malaysia, 8=Nepal, 9=Pakistan, 10=Philippines, 11= Singapore, 12=Sri Lanka, 13=Thailand, 14=Vietnam), $t=1991, \dots, 2009$.

The dependent variable RSR_{it} measures the domestic savings rate in country i at time t . $RGEP$ is the relative proportion of female to male in the labor force, $AgeDep$ is the old age dependency ratio while $YouthDep$ is the ratio of youth aged 14 or below. $LnGDP$ is the log of per capita real GDP while $LnGDPSQ$ is the square of $LnGDP$. $Credit$ represents domestic credit provided by the banking sector and $CreditSQ$ is the square of the $Credit$ variable. $X_{i,t}$ represents the vector of the other explanatory variables that are also included in the regression model.

IV. RESULTS

The Hausman specification test suggested the use of Random Effects, which is what we utilized and present results for. However, Fixed Effects estimations were also carried out (not presented in the paper) given that Horioka and Terada-Hagiwara (2011), Hung and Qian (2010) argue that omitting fixed effects seems to increase the residuals for some economies. The Fixed Effects results were consistent with the Random Effects results and are available upon request.

In Table 2 we present the random effects estimation results. These results show that holding all other variables constant, the $RGEP$ is positive and statistically significant across different

Table 1
Definitions

Real Savings Rate	100 - Government Share of GDP - Consumption share of GDP
Relative gender employment proportion (RGEP)	Relative proportion of females to males of the working-age population (ages 15–64) that actively engages in the labor market, by either working or actively looking for work.
Age Dependency Ratio	Proportion of population aged 65 and over
Youth Dependency Ratio	Proportion of population aged 14 and younger
Log(Real Per Capita GDP)	Natural log of Real Per Capita GDP
GDP growth	Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2000 U.S. dollars. GDP is the sum of gross value
Real Interest rate	Real interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator.
Credit	Domestic credit provided by the banking sector includes all credit to various sectors on a gross basis, with the exception of credit to the central government, which is net. The banking sector includes monetary authorities and deposit money banks, as well as other banking institutions where data are available (including institutions that do not accept transferable deposits but do incur such liabilities as time and savings deposits). Examples of other banking institutions are savings and mortgage loan institutions and building and loan associations.
GDP deflator	Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency.

Table 2
Random Effects Results

VARIABLES	<i>dy/dx</i>	<i>dy/dx</i>	<i>dy/dx</i>	<i>dy/dx</i>	<i>dy/dx</i>	<i>dy/dx</i>
	(1)	(2)	(3)	AR(1)	with time	fixed effect
	(1)	(2)	(3)	(4)	(5)	(6)
RGEP	0.152*** (0.0328)	0.140*** (0.0377)	0.0691*** (0.0248)	0.0685*** (0.0256)	0.0673*** (0.0255)	0.156*** (0.0249)
Aged Dependency	-2.232*** (0.465)	-2.041** (0.470)	-5.824*** (0.563)	-4.102*** (0.545)	-5.772*** (0.592)	-4.301*** (0.551)
Youth Dependency	-0.208 (0.183)	-0.236 (0.188)	-1.330*** (0.202)	-0.885*** (0.203)	-1.255*** (0.211)	-0.363* (0.215)
Log Per Capita GDP	9.324 (8.895)		30.22*** (8.032)	0.101 (7.566)	31.80*** (8.351)	23.52** (9.954)
Log Per Capita GDP squared	0.0427 (0.498)		2.174*** (0.445)	0.528 (0.419)	2.287*** (0.465)	-0.616 (0.540)
Credit	0.129*** (0.0374)		0.172*** (0.0576)	0.0613* (0.0354)	0.159*** (0.0604)	0.238*** (0.0537)
Credit squared	-0.000345* (0.000187)		-0.000205 (0.000300)	-0.000132 (0.000167)	-0.000132 (0.000318)	-0.000546* (0.000283)
Inflation	0.142** (0.0606)	0.0202 (0.0572)	0.213** (0.0877)	0.0780* (0.0444)	0.252** (0.100)	0.405*** (0.0896)
Real Interest rate	0.264*** (0.0842)	0.224*** (0.0822)	0.360*** (0.117)	0.141** (0.0619)	0.403*** (0.133)	0.638*** (0.120)
GDP growth	0.291*** (0.0581)		0.531*** (0.0930)	0.172*** (0.0328)	0.611*** (0.116)	0.455*** (0.104)
Lagged GDP growth		0.279*** (0.0557)	0.458*** (0.0912)	0.106*** (0.0307)	0.560*** (0.112)	0.375*** (0.103)
Lagged Per Capita GDP		11.24 (9.257)				
Lagged Per capita GDP squared		-0.123 (0.523)				
Lagged Credit		0.102*** (0.0372)				
Lagged Credit Squared		-0.00023 (0.00018)				
Asian crisis dummy						-12.10*** (1.538)
Post Asian crisis						4.173*** (1.399)
pre Asian crisis						0.423 (2.109)
Observations	251	251	251	251	251	251
Number of country	14	14	14	14	14	14

Note: All estimations include a constant term not presented here; Standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1

model specifications. A one percent increase in the *RGEP* is found to have about a .1% increase in the savings rate. Clearly, the magnitude of the change has not been significant. However it is to be noted that the relative proportion of females to males in the labor force has been low and it has increased by only around .1% over the twenty years covered in this study.⁴ This goes to show that if the countries in the sample could make considerable improvements in the gender composition of the work force, they are likely to experience greater impact on the savings rate. Aging population is found to have a consistently negative and statistically significant impact on the savings rate. Holding all other variables constant, a one percent increase in the aging population is found to increase the savings rate by between 2 to 5%. In addition, GDP growth and its lagged value is also found to have a consistently positive and statistically significant impact on the savings rate. The coefficient values show that a one percent increase in the growth rate leads to a .2% to .5% increase in the savings rate, holding all other variables constant.

In addition to the above, the youth dependency variable is found to have a negative and statistically significant impact on savings. The impact of uncertainty as measured by the inflation rate is found to be positive and statistically significant for all specifications of the model. In the final specification of the model presented in Table 3, we include three dummy variables following Park and Shin (2009). These are the country specific *Asian Financial Crisis Dummy* and the two sub-period dummies relating to the countries affected by the Asian Financial Crisis, the *Pre-crisis Dummy* and the *Post-crisis Dummy*. Similar to Park and Shin (2009) we find the Asian Financial Crisis country dummy to be negative and significant implying that the crisis had a negative impact on saving rates in the countries that were affected by it. Additionally, the *Post-crisis Dummy* is positive and statistically significant while the *Pre-crisis Dummy* remains statistically insignificant. The results relating to the sub-period dummies are also similar to those of Park and Shin (2009) showing that the countries affected by the crisis were more likely to increase saving in the post crisis period as opposed to the pre-crisis period.

Table 3 presents results pertaining to random effects estimations but after correcting for the potential endogeneity of the *RGEP* variable. It is quite possible that this variable along with the dependent variable are being driven by the economic growth in the respective countries. In addition, the savings rate, which is the obverse of consumption rate, could be driving female labor force participation rates; a drive for higher consumption pushes women into the labor force. Alternatively in times of economic downturns, household budget constraints and desire to maintain consumption levels are satisfied by increases in female labor force participation, which could potentially have a negative impact on savings. The reverse would be the case during economic booms. These arguments point to a reverse causality relation between savings and the *RGEP*. Additionally, it is hard to determine the direction of causality leading to a simultaneity bias. We have utilized a one period lag of the gender employment index to address the simultaneity issue and the results remain robust to this change in specification. In order to address the endogeneity issue we utilize an instrumental variables estimation technique⁵. We instrument for the *RGEP* with a variable which measures the proportion of seats held by women in national parliaments in each country. First stage estimation results attest to the appropriateness of this variable as an instrument.

These results show that the *RGEP* variable is positive and statistically significant across different model specifications and the magnitude of the impact is considerably larger. On average

Table 3
Random Effects Instrumental Variables Results

VARIABLES	<i>dy/dx</i>	<i>dy/dx</i>	<i>dy/dx</i>	<i>dy/dx</i>	<i>dy/dx</i>	<i>dy/dx</i>
	(1)	(2)	(3)	(4)	With time	fixed effect
RGEP	0.779** (0.337)	0.693** (0.289)	0.805*** (0.267)	0.36*** (0.114)	0.345*** (0.0754)	0.352*** (0.0761)
Aged Dependency	-2.2*** (0.767)	-2.04** (0.711)	-2.05*** (0.784)	-3.13** (0.898)	-2.69*** (0.771)	-2.89*** (0.768)
Youth Dependency	0.549** (0.271)	0.411* (0.247)	0.0600 (0.284)	-0.175 (0.358)	0.436 (0.335)	0.480 (0.339)
Log Per Capita GDP	46.2*** (15.30)	37.9*** (13.51)		5.163 (17.79)	64.80*** (21.28)	69.79*** (21.95)
Log Per Capita GDP squared	-1.81** (0.871)	-1.417* (0.781)		0.382 (0.962)	-2.784** (1.141)	-3.04*** (1.177)
Credit	0.13*** (0.0448)	0.12*** (0.0409)		0.20*** (0.0776)	0.276*** (0.0688)	0.294*** (0.0699)
Credit squared	-0.004** (0.0002)	-0.0004* (0.0002)		-0.0006 (0.0004)	-0.009** (0.00039)	-0.0012** (0.00040)
Inflation	0.0992 (0.0758)	0.155** (0.0722)	0.0746 (0.0748)	0.31*** (0.116)	0.482*** (0.111)	0.487*** (0.111)
Real Interest rate	0.239** (0.116)	0.28*** (0.108)	0.31*** (0.119)	0.45*** (0.156)	0.740*** (0.158)	0.786*** (0.161)
GDP growth		0.25*** (0.0633)		0.48*** (0.128)	0.293** (0.135)	0.316** (0.134)
Lagged GDP growth			0.21*** (0.0661)	0.33*** (0.126)	0.167 (0.138)	0.203 (0.137)
Lagged Per Capita GDP			39.2*** (13.76)			
Lagged Per capita GDP squared			-1.749** (0.832)			
Lagged Credit			0.0831* (0.0446)			
Lagged Credit Squared			-0.00015 (0.00021)			
Asian crisis dummy					-13.2*** (2.308)	-16.36*** (3.013)
Post Asian crisis						4.066** (1.905)
pre Asian crisis						1.032 (2.565)
Observations	224	224	224	224	224	224
Number of country	13	13	13	13	13	13

Note: All estimations include a constant term not presented here; Instrument for the gender employment ratio is the proportion of women representation in respective parliaments; Standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1

a one percent increase in the proportion of females to males in the labor force is found to have about a .7% increase in the savings rate, holding all other variables constant. In addition, aging population is found to have a consistently negative and statistically significant impact on the savings rate. Moreover, there is evidence that GDP growth and its lagged value has a statistically significant impact on the savings rate. The evidence confirms a non-linear relationship between GDP growth and the savings rate.

The evidence regarding the impact of the youth dependency variable on the savings rate is relatively weak. It is statistically significant in two estimations and is found to have a positive impact on savings. The impact of uncertainty as measured by the inflation rate is not statistically significant in terms of its impact. In the final specification of the model we include three dummy variables following Park and Shin (2009). These are the country specific *Asian Financial Crisis Dummy* and the two sub-period dummies relating to the countries affected by the Asian Financial Crisis, the *Pre-crisis Dummy* and the *Post-crisis Dummy*. Similar to Park and Shin (2009) we find the Asian Financial Crisis country dummy to be negative and significant implying that the crisis had a negative impact on saving rates in the countries that were affected by it. Additionally, the *Post-crisis Dummy* is positive and statistically significant while the *Pre-crisis Dummy* remains statistically insignificant. The results relating to the sub-period dummies are also similar to those of Park and Shin (2009) showing that the countries affected by the crisis were more likely to increase saving in the post crisis period as opposed to the pre-crisis period.

Overall, the estimation results are fairly robust across different model specifications and estimation methods and show that an increase in the relative proportion of females to males in the labor force has had a strong positive and statistically significant impact on saving rates in developing Asia after controlling for all other relevant factors that are also found to explain saving behavior. In addition, the increasing age dependency ratios have had a significant negative impact on savings while robust economic growth and increased access to credit has had a significant positive impact on saving.⁶ This seems to suggest that on average the countries in the sample have reached the stage of demographic maturity at which old age dependency rises swiftly and saving rates fall. If one looks at coefficient values it becomes apparent that the age dependency ratio has had by far the strongest detrimental impact on savings.

One limitation of the above analysis is that the endogeneity problems may not be limited to the relative gender employment proportion alone and could potentially be present with relation to some of the other explanatory variables as well. GDP growth, per capita GDP, and credit are all likely to be endogenous with respect to the savings rate. The problem of utilizing an IV specification as above is the availability of appropriate instruments for all potential endogenous variables. Arellano and Bond (1991) provide a way to deal with this situation using a dynamic panel method. There is every reason to believe that the relationship between savings and the other variables discussed here is a dynamic relationship. The literature on savings suggests that the relationship is dynamic though most empirical papers carry out a static analysis. It is very common in the literature to use lagged values of the dependent variable (AR analysis) or of the explanatory variables. In addition, the literature suggests that savings rates show persistence in their behavior, all of which suggest a dynamic relationship. Linear dynamic panel-data models include lags of the dependent variable as covariates and contain unobserved panel-level effects, fixed or random. These estimations produce inconsistent standard estimators because the

Table 4
Dynamic Panel Estimations with Endogenous Variables (in Bold)

<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
savings (lag 1)	0.900*** (0.110)	0.902*** (0.107)	0.892*** (0.0916)
savings (lag 2)	-0.137* (0.0821)	-0.136* (0.0796)	-0.0955 (0.0665)
RGEP (no lag)	-0.321*** (0.0953)	-0.320*** (0.101)	-0.340*** (0.0770)
RGEP (lag 1)	0.328*** (0.0898)	0.327*** (0.0939)	0.350*** (0.0729)
Aged Dependency (no lag)	-0.861 (3.665)	-1.048 (3.562)	-2.006 (3.400)
Aged Dependency (lag 1)	1.036 (3.685)	1.278 (3.572)	2.874 (3.389)
Youth Dependency (no lag)	-0.637 (1.185)	-0.452 (1.069)	-0.915 (0.940)
Youth Dependency (lag 1)	0.576 (1.063)	0.385 (0.944)	0.947 (0.786)
Log per Capita GDP (no lag)	-218.3** (94.09)	-219.0** (93.80)	-57.03 (111.1)
Log per Capita GDP (lag 1)	220.4** (93.79)	221.0** (93.33)	77.65 (109.1)
Log per Capita GDP squared (no lag)			-3.923* (2.031)
Log per Capita GDP squared (lag 1)			2.803 (1.895)
Credit (no lag)	0.0124 (0.0113)	0.0113 (0.0122)	-0.00745 (0.0255)
Credit (lag 1)	0.00368 (0.0109)	0.00351 (0.0115)	-0.0265 (0.0195)
Credit squared (no lag)			0.000114 (0.000105)
Credit squared (lag 1)			0.000121 (0.000104)
Inflation (no lag)	0.0162 (0.0422)	0.0162 (0.0416)	0.0502 (0.0438)
Inflation (lag 1)	0.00450* (0.0274)	0.00761 (0.0291)	0.00802 (0.0287)
Real Interest rate (no lag)	0.0999* (0.0673)	0.0978* (0.0674)	0.0879* (0.0611)
Real Interest rate (lag 1)	-0.00441 (0.0524)	-0.00432 (0.0547)	-0.0103 (0.0563)
GDP growth (no lag)	2.443** (0.950)	2.451*** (0.943)	1.542* (0.930)

contd. table 4

1	2	3	4
GDP growth (lag 1)	0.00369 (0.0365)	0.00650 (0.0329)	0.0120 (0.0332)
Post Asian crisis		-0.223 (0.418)	0.0887 (0.421)
Pre Asian crisis		-0.391 (0.439)	-0.418 (0.398)
Year	-0.0667 (0.0778)	-0.0875 (0.0826)	-0.106 (0.0955)
Observations	223	223	223
Number of countries	14	14	14

Note: All estimations include a constant term not presented here; Instrument for the gender employment ratio is the proportion of women representation in respective parliaments; Standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1

unobserved panel-level effects are correlated with the lagged dependent variables. Arellano and Bond (1991) derived a consistent generalized method of moments (GMM) estimator for the parameters of this model. In this model endogenous variables are treated similar to the lagged dependent variable. Levels of the endogenous variables lagged two or more periods can serve as instruments. The dynamic model that is estimated here takes the form as given below:

$$RSR_{i,t} = \beta_0 + \beta_1 RSR_{i(t-1)} + \beta_2 RSR_{i(t-2)} + \delta'(L) x_{it} + \lambda_t + \eta_i + v_{it} \quad (2)$$

where $RSR_{i,t}$ measures the domestic savings rate in country i in time t , the vector x_i contains a set of explanatory variables, $\delta(L)$ is a vector of polynomials in the lag operator. In addition, the specification also contains a time effect λ_t that is common to all countries, and a permanent but unobservable country specific effect η_i and an error term v_{it} . The dynamic panel estimations are presented in Table 4. The specification utilizes a lagged dependent variable (in this case two lags) and use excluded lags as instruments for the other lags.

In the first column in Table 4 we assume only *RGEP* to be endogenous, in column 2 we assume *LnGDP*, which is the log of per capita real GDP and *Credit* which represents domestic credit provided by the banking sector, and GDP growth are also endogenous. In column 1 we do not include the per capita GDP squared term or the dummy variables. In column 2 we do not include the per capita GDP squared term. In column 3 we present the complete model with all variables included. All the results have robust (heteroscedasticity and serial correlation consistent) standard errors. The dynamic panel results suggest that the *RGEP* variable has a negative impact in the immediate period but that its impact is becomes positive and significant after one period lag. The immediate negative impact of the changing *RGEP* variable on savings rate mimics Carroll and Weil (1994) where they found that (assuming everything else remains unchanged) an increase in income would have a negative impact on savings via the wealth effect. However, the results here suggest that the negative impact is temporary since a one period lag in the *RGEP* variable is found to have a positive impact on the savings rate. We find similar results for per capita GDP which has a negative and statistically significant impact in the immediate period but its impact is positive and statistically significant after a one period lag. In the third column, once we include the squared per capita GDP term, then per capita GDP ceases to be significant

but the squared term is statistically significant and negative. In addition, GDP growth is seen to have a positive and statistically significant impact on growth in the immediate period but its impact becomes statistically insignificant after incorporating a lag. The real interest rate is also seen to have a positive and statistically significant impact on the savings rate but the level of significant is lower.

V. CONCLUDING REMARKS

In this paper we set out to test for the role played by economic growth, the aging of the population and the increase in female representation in the labor force in explaining domestic savings rates in developing Asian countries over the 1991 to 2009 time period. There has already been considerable attention paid to the role of aging and economic growth on savings. The changing gender composition of the work force and its impact on savings has not been received much attention in the savings literature. The literature on female autonomy shows that increased participation in the labor force increases women's bargaining position within the family. In this paper we are particularly interested in seeing if and how increased proportion of females to males in the labor force influenced aggregate savings, along with the aging of the population and economic growth, after controlling for other factors that also impact savings.

Even though there is very limited literature on the topic of changing gender composition of the work force, it shows that increases in female labor force participation and income potential have a significant impact on household and aggregate savings implying that women have a greater propensity to save as compared to men. In this paper we test this hypothesis with reference to the developing countries in Asia. The hypothesis relating to the impact of changing gender composition of the work force is particularly relevant to the sample of countries in our sample. Asian countries have traditionally been characterized as patriarchal and gender gaps in education and labor force participation have been a key feature of most of these countries. However, the economic growth in recent decades has brought with it a change in the gender composition of the work force with more and more women finding employment in the formal labor force.

The results of this paper support the hypothesis that increases in female representation in the labor force of the developing Asian countries play a statistically significant role in explaining the increases in savings rates experienced by these countries though the magnitude of impact is small. The magnitude of impact is related to the relative disproportion in the proportion of females to males in the formal work force and the relative lack of improvement in these proportions for developing countries. In addition, there is evidence that supports that most of the increase in relative proportion of females in the labor force in developing countries has been related to lesser paying jobs, which might also explain why the impact on savings has been relatively small as well. The results relating to the impact of an increase in the relative proportion of females to males in the labor force and its impact on the savings rate are important for policy makers since traditionally women have been under-represented in the labor force, especially in South Asia.

Over and above the *RGEP* variable, the other variables which remain consistently statistically significant influences on savings rates (regardless of specification) are per capita GDP and GDP growth. The aging of the population is also found to have a significant negative impact on

savings but this impact does not hold for the dynamic analysis. The magnitude of impact of the aging population (though not robust when considering the dynamic analysis) and economic growth are much greater than the gender composition of the labor force. The negative impact of the aging population in this region seems unavoidable due to the demographic transition these countries are experiencing. The results of this paper imply that efforts should be made to counter the negative impact of aging by embracing income and growth enhancing strategies on the one hand while continuing to promote financial market instruments and making efforts to increase the relative proportion of females to males in the labor force which would collectively counter the dampening impact on aging on the savings rate in these countries.

Notes

1. The female to male employment ratio is usually much higher in developed countries. For example, according to the World Bank's World Development Indicators this ratio is around .86 (with an increasing trend) in Canada, around .81 (with an increasing trend) in Australia, .83 (with an increasing trend in the United States), and around .81 in the U.K (with an increasing trend).
2. There are papers that disagree that men and women have different attitudes to risk taking but rather that they have a difference in information processing (see Embrey and Fox, 1997; Clark and Pitts, 1999; Schubert, Brown, Gysler and Brachinger, 1999. Graham, Stendardi, Myers and Graham, 2002)
3. Many have questioned the positive relation between income and savings with respect to the United States which has witnessed a falling trend in savings since the 1990s. Maki and Palumbo (2001) explain this fall in savings to be a result of increased wealth related to gains in the stock market in the 1990s which increased people's wealth, which led to increase in spending and reduction in savings.
4. One could probably attribute culture to be one of the reasons for the low percentage of and the slow increase in the female to male ratio in the work force especially with a pro male workforce in developing countries in Asia.
5. We also carried out results without utilizing instrumental variables. These results are very similar to the IV results and are available upon request.
6. The results remain robust to changes in specification and/or variables. For example, including aging population and/or higher female to male participation in the regression did not change the overall results. This remains true for the static as well as the dynamic analysis.

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