1. Introduction

In the last ten years, Chile's overall economic performance has been outstanding in most respects. Growth has been 7% on average, inflation has been in the single digits, unemployment has stood at an average 5.5%, investment (both foreign and domestic) has flourished, and people have realized that their welfare is improving. In particular, national saving has increased dramatically, from extremely low levels of around 6% of GDP in the early 1980s to a sterling 26% in the last three years; and as early as 1990, the national saving rate had surpassed the 23% mark (which was 8 points above the 1960-1989 average rate)[1]. This increasing trend and the high saving levels contrast with the rest of Latin America, where saving figures have been declining since the 1960s; today, even after many other countries in the region have implemented the sort of structural reforms that Chile undertook in the late 1970s and 1980s, saving in the rest of Latin America are in the 15 - 20% range.[2] Very recently, the "tequila effect" that followed the Mexican devaluation of December 1994 called into question the basis on which economies such as Argentina's and Mexico's are implementing reforms. But again, Chile's economy was basically unaffected. All things together, some analysts rank Chile as the only economy in the region that qualifies as a "take-off economy,"[3][4] or development economy.

In a sense, Chile's enduring success and proved insulation from the "tequila effect" are due to its high national savings, which provide the funds needed for investment and eventually growth, and substitute for external savings, which are highly volatile in the presence of events such as the Mexican crisis of December 1994. What has made Chile's savings so high, both in comparison to its own history and with respect to the rest of the region? Did Chileans have a sudden change in preferences that inclined them to thrift? Or were some key policies implemented? Did the structural and liberalizing reforms of the late 1970s and 1980s have anything to do with it? Did the pension system reform that moved social security from a pay-as-you-go scheme to a fully funded scheme have any effect on total savings? Was conservative fiscal management accountable for some of the increase in savings? What was the role of external saving in complementing or crowding out domestic saving?

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[1] All rates are calculated at current prices.

[2] See Figures 1 and 2.

[3] See Schmidt-Hebbel and Serven (1995).

[4] A take-off economy is a developing economy that has achieved high and sustained saving and growth rates for at least ten years (Korea, Singapore, Taiwan, China, Indonesia, and the like).

This paper tries to empirically disentangle some of the puzzles with historical data that span the 1960-1995 period. In Section 2, below we check whether the most commonly mentioned stylized facts concerning savings in the world's recent history hold for the case of Chile. Section 3 presents some theoretical underpinnings necessary for the empirical models. Then, Section 4 use empiral models to search for clues to Chile's move to a high saving trend as early as 1985-86. Finally, Section 5 presents concluding remarks.

2. Do the Most Accepted Stylized Facts About Savings Hold for Chile?

Following Schmidt-Hebbel and Serven (1995) and Edwards (1995), there are a number of empirical regularities concerning savings when one looks across countries. These are: (1) Domestic saving rates and development (as measured by income levels) are positively correlated, although this correlation is lost when a country reaches a high income per capita; (2) Domestic saving rates and economic growth rates are also positively correlated across countries; (3) Domestic saving rates and investment ratios are strongly and positively correlated; and (4) There is no clear correlation between saving rates and income inequality. Do Chile's time-series data for the last thirty-six years conform to these stylized facts?

Figures 2 to 7 and Tables 1 and 2 allow us to (partially) answer this question at a tentative level. The positive correlation between savings and income levels, which has been documented by a number of empirical studies (e.g., Collins, 1991; Carroll and Weil, 1994; Edwards, 1995, Schmidt-Hebbel et al, 1992) does prevail for Chile, according to both eye inspection of Figures 2 and 3 and the correlation matrices in Tables 1 and 2. However, such a positive association is: (a) stronger for figures in 1986 pesos than for figures as percentage of GDP (around 0.9 in the former case and around 0.7 in the latter); (b) significantly higher for the last ten years than for the previous 25 years (correlations range between 0.8 and 0.97 for 1985-1995, while they are between minus 0.29 (!) and 0.28 in the 1960-1984 period); and (c) slightly higher for total private saving than for gross national saving (for the whole sample, correlations for the former hover between 0.75 and 0.91, while for the latter they hover between 0.65 and 0.89). Point (b) above could be an indication that Chile has not yet achieved a level of income high enough to make the saving rate level off, as apparently happened with industrial countries with per capita income levels above US$8,000 (in 1987 dollars), as reported in Schmidt-Hebbel and Serven (1995b). However, the gross national saving rate has been increasing much more slowly in the last four years than it did between 1985 and 1990.

The positive association between savings and economic growth found in cross-country studies (see for example, Bosworth, 1993; Carroll and Weil, 1994; and Maddison, 1992) also exists in the case of Chile, although it is much less evident from visual inspection (see Figures 4 and 5) and much lower than the one

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[5]See Edwards (1995) and Schmidt-Hebbel and Serven (1995) for complete presentations of these stylized facts.

[6]This paper will not attempt to address the relationship between savings and income distribution because of lack of appropriate, consistent data on the latter variable. In any case, it seems that in Chile, as with cross-country evidence, such a relationship is not strong, at least based on data for recent years: between 1988 and 1994, income distribution as measured by the Gini coefficient has not improved, while savings rates have doubled.

[7]Current GDP per capita is close to US$5,000 in Chile, in 1995 dollars.

found for GDP. Differences between figures in 1986 pesos and rates as percentage of GDP are not important now, but again, the correlations tend to be stronger for the last ten years than for the 1960-84 period.

One result that is clear from these first two stylized facts is that the overall positive and significant associations between savings and income, on one side, and between savings and growth, on the other, are driven by the recent past, which is exactly when Chile could be classified as a "take-off economy" because of its saving and growth record. Indeed, the effect of the recent past on the overall sample is strong enough to make correlation figures higher for Chile than for developing countries and the world at large, and closer to other "take-off economies" (as reported in Schmidt-Hebbel and Serven, 1995).

The similarities of Chile with other "take-off economies" over the last ten years are also extended to the close association between national savings and national investment. Indeed, in the 1985-1995 period, the correlation between measures of these two types of variables have been in the 0.93 - 0.97 range, a very high number even when compared to OECD and East Asian countries (0.55, according to Schmidt-Hebbel and Serven, 1995). These figures almost double the same association for the 1960-1984 period. The counterpart of this association between investment and saving is the behavior of foreign savings, which, as shown by Figure 8, has been positive for the entire 1960-1995 period, but has clearly been declining since the mid 1980s. In other words, as the association between national (and private) savings and national investment has become closer in the last ten years, foreign savings has been substituted by domestic savings.

3. Some Theoretical Underpinnings of These Stylized Facts

These stylized facts, common to many countries and empirical studies, have inspired several (at times competing) theoretical explanations. Of course, any saving-consumption theory would predict that income and/or wealth is a main driving force behind saving. However, discrepancies as to what is the most appropriate definition and measure of such an income or wealth variable place different theories well apart. In the case of the Keynesian theory, it is current income that matters, while permanent income concepts (net of taxes) are relevant in the life-cycle hypothesis (over the life cycle) and in the homonymous permanent-income hypothesis (over an infinite horizon). The stylized fact connecting both national and private savings to GDP in Chile confirms that current income must have played a role in the determination of saving, but this is not enough to conclude that a Keynesian hypothesis is the most appropriate. In fact, any empirical measure of permanent income would likely be highly correlated to current income.

There are, however, attempts to disentangle which measure of income is most appropriate from an empirical point of view. Indeed, Corsetti and Schmidt-Hebbel (1995), following an approach developed by Corbo and Schmidt-Hebbel (1991), estimate a reduced-form equation for private consumption in Chile for the 1971 - 1995 period that nested three main consumption hypotheses (Keynesian, permanent income without Ricardian equivalence, and Ricardian equivalence or direct crowding-out). They first divide all income, consumption, and saving variables by current disposable income (to obtain ratios), and then place a measure of permanent disposable income and permanent public saving as right hand

[8]And increase even more when one looks at the association between national investment and total private savings, which in one case is even negative.

[9]Except in 1976, as measured in pesos.

variables (together with some other variables). These authors find that Chilean consumers are predominantly Keynesian, since the point estimate of the coefficient of such a variable (0.75) is six times larger than the coefficient for (neoclassical) permanent disposable income, while the latter coefficient is also lower than the point estimate of the coefficient for permanent public saving. The first result is attributed to the presence of binding liquidity constraints that limit the capacity of rational consumers to smooth out their consumption profiles, while the second result is interpreted to mean that liquidity constrains are more important than "Ricardian farsightedness."

Liquidity or borrowing constraints are a favorite explanation of the failure of neoclassical hypotheses to predict consumption or saving. They are the outcome of actual financial markets imperfections; i.e., the difficulties of using human capital as collateral to borrow, the fact that financial markets do not clear because of default risks, or limitations imposed by policy regulations and restrictions. As reported in Schmidt-Hebbel and Serven (1995), there have been many attempts to model liquidity constraints in models with microfoundations, with varying degrees of empirical success. Among them, one that merits some attention for the case of Chile's recent past, at least at a tentative level, is a buffer-stock hypothesis that claims that risk-averse and forward-looking households raise their saving when they anticipate tighter constraints in the future.

The effects of liquidity or borrowing constraints on consumption-saving decisions are far reaching. As suggested above, they change the nature of the relationship between saving and income, implying a closer connection of the former with current income instead of permanent income. Similarly, it lessens the impact of interest rates on saving decisions, since there could a wide range for households in which such constraints are binding, which means they have no access to credit to smooth out consumption. Since liquidity constraints can also be the result of other developments in the economy, and since they normally force households into corner solutions, there is room in empirical studies to incorporate proxy variables that reflect liquidity constraints even if we have not derived the estimated equations from first principles. For an open development economy such as Chile, a case can be made that liquidity constraints are in part the result of scarcity of overall domestic saving (in relation to investment needs), so that foreign saving must play a role in loosening (or tightening) these constraints.

As such, liquidity constraints at the country level -- or the relevant role played by foreign saving -- could be at the heart of the close connection found between national saving and national investment, in the sense that imperfect capital account integration to world markets could prevent firms in the home economy from having access to enough funds at prevailing world interest rates to finance their investment projects. An abundance of such funds, on the other hand, would lessen the need of domestic firms to use their own profits for

[10]See Stiglitz and Weiss (1981).

[11]An interesting discussion around this issue is whether liberalization (or deepening) of previously repressed financial markets will, by means of loosening borrowing constraints, decrease savings. It is worth mentioning that proponents of such a policy back in the 1960s were thinking in the opposite effect, as liberalized markets would experience an increase in real interest rates and, thus, savings would go up (see McKinnon, 1973, for example).

[12]Deaton (1992).

financing investments.

The association between saving and growth, both endogenous variables, has an easy and a difficult interpretation. The easy one goes from saving to growth, in the sense that more saving could allow more investment -or capital accumulation- and this in turn will induce more growth. The difficult one, motivated by findings that indicate that growth Granger -- causes saving (see Carroll and Weil, 1994) -- runs in the opposite direction. This direction, from growth to saving, has been much more difficult to justify from a theoretical point of view, as explained by Carroll and Weil (1994). Even though growth could precede saving in a life-cycle model as younger saving generations see their income growing faster that the decline in savings of the old (see Modigliani, 1971), that argument tends to be disregarded on the ground that it is simply a result of aggregation. At the heart of the debate is a presumed negative effect, at the household level, from growth to saving: higher growth means more rapidly increasing income, both current and likely permanent, so this will tend to induce higher consumption per household and thus, less (not more) saving. Liquidity constraints tend to reduce this negative effect and in some cases to eliminate it (for example, when a household has to accumulate a (large) down payment before buying a house), but it is hard even for liquidity constraints to reverse the effect. More promising avenues in this respect are models with consumption habits, where household preferences not only are specified depending on current consumption but also on a stock of accumulated consumption in the past; and models in which wealth or capital are added to current consumption as arguments in the household utility functions, in the tradition of the "capitalist spirit" of classical economists.

As somewhat implicit above, uncertainty is also an element to be taken into account when discussing saving decisions. Precautionary saving has often been used for to explain a strong association between consumption of risk-averse households and current income when this variable is characterized by high uncertainty. Also, uncertainty about life length could explain why retired people do not dissave, as predicted by life-cycle theories. However, direct empirical tests of the precautionary motive for saving are difficult to implement, so its importance has, until now, been basically inferred from indirect tests or simply speculation.

4. Beyond the Stylized Facts: Results from Empirical Models

Before going into empirical testing, a warning on data quality is necessary. As in most developing countries, private saving indicators in Chile are measured as residuals. Roughly, total domestic investment (which is directly calculated) is assumed to be financed by the sum of foreign saving (whose data come from balance of payments accounts) and gross domestic saving. This, in turn, is assumed equal to public saving (derived from fiscal accounts) plus private saving, which is the residual. Some decomposition of this residual can be computed after 1981, as between pension fund saving and other private, voluntary saving. The latter is the variable we use most in the estimations below, in spite of its imperfections.

Data problems do not come only from the way savings are measured, but also from changes in input-output matrices that make it very difficult to obtain

[13]See Carroll and Weil (1994).

[14]See Schmdit-Hebbel and Serven (1995) and the literature cited therein, such as Zou (1993).

consistent national account series for reasonably sized samples. In spite of these problems, we managed to construct annual time series for different measures of savings, aggregate output, and investment, spanning 1960 to 1995.

The estimation strategy we follow in this paper is the following. First, we check stationarity of all series involved. If there is evidence of unit roots in the series (which happens, as seen below), running simple regressions -- either OLS or TSLS -- or unrestricted VARs would create a specification error that may require a special interpretation. Indeed, if the estimation of one (at least) linear combination of the series renders stochastic disturbances that are stationary, then the series are said to cointegrate. In economic terms, this would mean that there is a long-run equilibrium relationship among those variables - basically, they have a similar stochastic trend - represented by such a cointegrating equation. At the same time, in the short run series could deviate from this long-run equilibrium provided they return to it sooner or later. This short-run deviation is estimated by means of an error correction model, which is basically a VAR estimated in first differences, plus the residual of the VAR estimated for the long-run relationship lagged one period. The coefficient of this residual will give a measure of the speed of adjustment from the short-run to the long-run equilibrium, and will also give some cues about Granger-causality relationships among variables in the system. The error correction model is estimated in two forms here, first as equations with contemporary variables (in first differences), to check point estimates, and then as VARs (also of first differences), to check dynamic effects through impulse-response functions and to double check causality issues through variance decomposition exercises.

The estimations are for the entire sample period, 1960 to 1995, but we keep an eye on the possibility of structural breaks in the data, especially after taking into account what we said in Section 2 above, in the sense of how the stylized facts tend to be more pronounced in the last ten years than in the two and a half decades preceding them. As it turn out, and in spite of such casual evidence, there is no strong evidence of structural changes circa 1985; we will see the implications of this later on.

4.1 Stationarity of Involved Series

We will work primarily with series in (thousands of) 1986 pesos per capita for all variables that come from national accounts (domestic savings, foreign savings, fiscal savings, output, investment, etc.), while economic growth is GDP growth in percentage terms. Table 3 indicates that the former series are clearly non-stationary, since the Augmented Dickey Fuller (ADF) tests do not allow us to reject the null hypothesis of the presence of a unit root for any of them. This result could be expected for series such as GDP per capita or gross domestic saving per capita, since they exhibit a clear trend, in particular starting in 1984-85. But unit roots are also found in the remaining series, perhaps as a result of a clearly changing variance. This is the case of GDP growth, and to a lesser extent, foreign saving and fiscal saving. Table 3 also shows that first differences of the reported series are stationary, except in the case of GDP. In this case, we tried an exponentially smoothed version of GDP, following the Holt-Winters method, whose first difference indeed turned out to be stationary. That the first difference of GDP per capita is not stationary seems to be consistent with the finding that GDP growth is not stationary either. In both cases, the

[15]The problems arise because of significant changes in relative prices in the last three decades (mainly as a result of structural reforms) and also because of high inflation all along, but especially in the 1971-74 period, when inflation was not only high but also repressed.

problem seems to be the highly volatile variance during the sample period.

Some authors claim that we could avoid using cointegrating analysis (something advisable when series are not too long) by setting up the empirical models with series as ratios to GDP rather than in real pesos, because (stochastic) trends would be less obvious. In the case of Chile, however, even series defined as ratios to GDP are nonstationary, as illustrated by Table 4. Besides, the model will need nevertheless to include some other series different from national account series (such as growth or terms of trade) that are also I(1).

4.2 Cointegration Models

That all series are I(1) does not guarantee that there exists a long-run relationship, or cointegration between them. We need to check which combination of series show this feature and then explore the economic sense of such cointegration. But on the other hand, the empirical models we subject to cointegration tests are to be inspired by economic theory.

We will concentrate on models in which the main dependent variable is voluntary private saving (mostly in per capita terms), and in which the "core" variables include: exponentially smoothed GDP (GDPPCSM), foreign saving (FSPC), government saving(GSPC), and GDP growth. All these variables are logged. As discussed above, any theoretical model will postulate private saving depending on some measure of income. The one chosen here is an intermediate step between current income (or GDP), which was found predominant in Corsetti and Schmidt-Hebbel (1995), and permanent income (tax included), since the exponential smoothing transformation yields a series with less sharp fluctuations. The inclusion of foreign saving is a direct response to the *a priori* belief that liquidity or borrowing constraints at the household level reflect liquidity constraints of the country as a whole. Also, so much has been said and debated about the relevance of capital flows on economies such as Chile's that we simply cannot leave it out. Government saving is also included in the models as a way to summarize the effects of taxes on saving (through disposable income) and the effects of government spending (since it provides public goods that, if nonexistent, would potentially imply different intertemporal consumption/saving decisions). In addition, GSPC is a variable that directly reflects policy decisions, and thus its impact on private saving would say something about what to do if the authority wants higher private saving. The inclusion of GDP growth is motivated by findings in Carroll and Weil (1994) and a strong presumption that consolidated economic growth is a key to saving in the medium run.

Several other variables are tried in the models, some of them directly, others in the form of dummy proxies. Among the ones tried directly, we include terms of trade (because of their effect on disposable income at the national level), inflation (as a measure of macroeconomic instability), and real M1 per

[16]In the estimation of a cointegration model below we need that all series have the same order of integration, which in this case is 1. So, as we will see, we will include both GDP growth and the exponentially smoothed version of GDP in the model (along with other variables, including savings).

[17]See Corsetti and Schmidt-Hebbel (1995) for example.

[18]See, for example, Morande (1988) and (1982), and Laban and Larrain (1994).

[19]To see the status of this hypothesis, see OCE (1996).

capita (as an indicator of liquidity constraints). Among the ones proxied by dummies, two deserve special attention: the emergence of private pension funds in the mid 1980s (which is associated with both compulsory saving and the development of long-term capital markets). The other is a tax reform carried out between 1984 and 1987 that substantially reduced corporate rates, placing them much lower than personal income rates. Thus, a strong incentive to postpone tax payments through investment of corporate profits was created. The alternative of including these two variables as full-fledged series was disregarded. In the case of pension funds, we use a dummy because a 1960-1995 series would contain zeroes for more than twenty years (no variance), and effective numbers from then on, thus implying a much higher variance. Besides, pension funds are a stock of accumulated compulsory private savings that we would be comparing to a flow of voluntary private savings. And even though pension funds did not exist as such before 1981, the previous system contemplated a government's responsibility for the elderly that could be compared to a pension fund. For the sake of completeness, we also include a model below in which the dependent variable is total private saving (TPS), whose main difference with voluntary private saving is pension fund saving starting in 1981. In the case of the tax reform, the issue is one of available data at the time of writing this paper. Future research should take this variable more seriously.

To check for cointegration, we applied the Johansen-Juselius test if the number of series was not too large, and applied the Engle-Granger procedure to all cases. The first test checks for the rank of the vector of coefficients that accompany the cointegrating vector in the error correction model. If the rank is 1, then there is 1 cointegrating equation; if the rank is 0, then the series do not cointegrate; if the rank is n, there are n cointegrating equations, provided n is less than the number of series in the model (otherwise, series are stationary to begin with). The Engle-Granger procedure tests for the presence of a unit root in the residual of the cointegrating equation, by simply applying an ADF test. As illustrated in Table 5, there is a strong indication that series in the specified models do cointegrate, and that in the case of the reduced models (2, 3, 4, and 5), the number of cointegrating equations is just 1 (as desired).

The residuals that were used in the implementation of the Engle-Granger procedure in Table 5 come from cointegration regressions estimated for each of the models. In the case of models 1, 2, 4, and 5, OLS was applied. In the case of model 3, TSLS was the estimation method. At this stage, not knowing much about the Granger-causality relationship between variables, a case could be made for using instrumental variables when there is evidence of contemporary correlation between LHS and RHS variables. The results of the cointegration equations are shown in Table 6, from which we can extract the following main features:

A. *Modified current income has a more than proportional effect on private saving even in the long run.* Indeed, elasticities with respect to GDPPCSM are in the 1.4 neighborhood in models 1 to 3 (remember that variables in these models are logs of 1986 pesos per capita), and the constant is high and very significant in model 4 (where saving is measured as a percentage of GDP). Although, as we will see below, this elasticity is lower than in the short run, still this result indicates that even in

[20]The reform to the social security system started in 1981, but it was not until 1986-87 that pension funds were substantial and made a difference in terms of providing incentives for private financial instruments.

[21]Here long run means that the result comes from an equation whose variables cointegrate.

the long run, private saving per capita would follow a more pronounced cycle than income. On the other hand, it also suggests that over the long run, sustained increases in income will take private saving at increasingly higher ratios with respect to GDP (as is evident from the last ten years' experience). There is no evidence in Chile that private savings could be leveling off (yet), since inclusion of square GDPPCSM in models 1 to 3 and GDPSM in model 4 does not significantly add to the models' fit (result not shown in Table 6).

B. *Not only current income matters but also its rate of growth* Also consistent with the stylized facts presented above, GDP growth has a strong influence on private saving in Chile: roughly, for each additional 1 percentage point of growth, private saving per capita will grow 3%. The issue of causality here is not trivial, neither at a theoretical level, as examined above, nor at the empirical level in the case of Chile (see below). But in any event, if we compound the (exponentially smoothed) income effect and the GDP growth effect, passing from a 4% to 6% GDP growth will mean, in the long run, that private saving per capita will grow more than 12% per year, so that in five years, the private saving ratio (as a percentage of GDP) can grow from 10 to 15 only on this account.

C. *Both foreign saving and government saving crowd out private saving, but the off-setting coefficients are well below 1.* In the case of foreign saving, it seems that an increase will lessen aggregate liquidity constraints, allow more access to (foreign) credit, and facilitate a smoothing-out of consumption without the need to resort to previous saving. For each 10% more of foreign saving, households and firms will see their need of savings reduced by 5%, quite a significant response. However, if one wants to look the problem from other side, 10% of extra foreign saving will, *ceteris paribus*, allow a 5% increase in available funds for investment, which is what counts more for growth. In other words, according to Chile's experience of the last 35 years, extra foreign saving has split evenly between more private consumption and more domestic investment, something half a way to the Latin American stereotype and halfway to the East Asian stereotype.

In the case of government saving, the cointegration results show some good news for the fiscal conservatives: according to model 4, a 1% of GDP increase in government saving will only imply a third of a percent of GDP reduction in private saving, therefore allowing an increase of total domestic saving of around two-thirds of a percent of GDP.

D. *The emergence of private pension funds after the social security reform may have played a significant role in increasing private savings* Indeed, the point estimates of the coefficient of the dummy constructed to capture such an effect (which is 0 from 1960 to 1985 and 1 from 1986 to 1995) are relatively large and significantly different from zero. We tried to mimic the effect of pension funds starting in 1985-86, because by that time they were sizable (as compared to GDP) and also because it was around those years that funds started to be invested more significantly into private sector instruments (bonds and stocks). This result is complemented below with some forecasting exercises, but still more research is needed because the dummy could be capturing other concurrent phenomena as well. If we

[22]See OCE (1996).

[23]We tried different definitions of the dummy, for example starting with

take it seriously, we should conclude that the financial deepening associated with the development of a fully funded pension system, coupled with more subtle factors (such as reduced myopia of consumers, who, because of the way the new pension system works, would be more aware of the nature of intertemporal saving/consumption decisions and their importance for retirement years). As an alternative, we estimated a model in which total private saving (as a percentage of GDP) is the dependent variable (that is, voluntary private saving plus compulsory pension fund saving), called Model 5 in Tables 5 to 7; and we excluded the pension fund dummy. The results turned out to be very similar to the ones for the remaining models.

E. *Other variables that affect private savings deserve further research as well.* This is the case of terms of trade, which have the wrong expected sign but are not significant; real M1 per capita, which has an important positive effect on private savings; and inflation, which has a low but significant positive effect on saving. In the case of real M1 per capita, we know at the theoretical level that the effect on savings could be ambiguous: an increasing real M1 could signify lessening liquidity constraints and thus more private consumption (and less saving) on average; but on the other hand, a higher real M1 could also mean deeper financial markets and a more favorable environment for private saving. Our result would indicate that the second effect was more relevant in the case of Chile, but we rather prefer to confirm it by using a broader definition of financial assets, which was not available at the time this paper was written. And in the case of inflation, recently OCE (1996) has made a case for the negative effect of macroeconomic stabilization plans (and thus, reduced inflation rates) on private saving. But this effect is essentially temporary, while our result here is for a cointegrating equation supposedly representing a long-run relationship. Again, further research is called for.

F. *From a statistical point of view, around 85% of private saving is explained by a core of variables that includes current income, foreign saving, government saving, GDP growth, and the pension funds dummy* This is why we concentrate further discussion in this paper on such a core of variables.

Two other aspects are worth mentioning. One is that in spite of the reasonably good fit of the regressions, there are clear signs of autocorrelation

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ones in 1981, but the dummy's coefficient was not significantly different from zero and its sign was negative.

[24]An interesting issue here is that the participation of pension funds in stock markets implies a somewhat upward trend in stock prices and definitively more stable stock prices. This is a factor that could favor private saving, at both the household and the corporate level.

[25]See Corsetti and Schmidt-Hebbel (1995) for a list of channels through which a fully funded pension fund system could affect private consumption and saving.

[26]Among the elements that are particular to Chile and that could be behind this unusual result is the fact that financial indexation is widespread in Chile and has a long and respected tradition.

(see the DW statistics and the Breusch-Godfrey F tests). This should come as no surprise since this is a cointegration model where short-run movements could differ from long-run movements, the difference being an error of specification which is corrected by means of an error-correction model for the short run relationships. The estimated cointegration equations in Table 6 are used below to estimate the short-term dynamic models. The other point is that the estimations in Table 6 are remarkably stable along the 36-year period, as indicated by standard stability tests (Cusum and Cusum of squares). Thus there is no evidence of structural breaks in the mid 1970s or in the mid 1980s, which means that the cointegrating vectors account for the break in the series implicit in the unit root tests.

4.3 Error-Correction Models

Following Phillips and Loretan (1991), we estimate the error-correction models for the short run behavior of private savings by adding leads of the righthand side variables to capture the presence of any feedback effect from voluntary private savings to the so-claimed explanatory variables. This will give us some indication of whether causality is or is not running from saving to income, foreign saving, government saving, and GDP growth. By looking at the results of the ECM in Table 7, we extract the following comments:

G. *There is no evidence that voluntary private savings is Granger-causing RHS variables*. Indeed, all coefficients of leads of RHS variables in models 2 and 4 for which we estimate an EC equation are not significantly different from zero.

H. *The estimated values of the error correction term reveal a rather fast adjustment between the short run and the long run* Ranging between 0.46 and 0.61 in absolute terms, these point estimates show the right sign (if voluntary private saving moves beyond its long-run relationship with RHS variables, it will eventually come back to it), and indicate that it takes approximately one year to eliminate 50% of the discrepancy and close to three years to reach 90% of the adjustment.

I. *Most of the adjustment between short and long run falls in the effect of per capita income (or GDPPCSM); and, as theory would predict, private saving is more sensitive to income changes in the short run than in the long run*. Indeed, the only variable for which there is a significant difference between the cointegration equations and the EC equations is current income. This difference suggests that in the short run, faced with an increase in income, people tend to increase saving more pronouncedly because they are not sure whether the increase in income is permanent or transitory. The evidence shows, however, that this is not the case for foreign saving or government saving, which within a year convey enough information so as to distinguish between permanent and transitory shocks.

As expected, the serial correlation present in the cointegration equations disappears in the EC models, confirming that the error-correction mechanism fixes the specification error that creates serial correlation in the cointegration equations.

4.4 Vector Error Correction Models

As a complement to the EC procedure applied to contemporary variables (except for the error-correction term itself, of course), we use a similar strategy applied to VAR models. Here we have two options. One is to apply Johansen-Juselius technique and directly estimate vector error correction models;

however, given the rather reduced number of observations we have (36), the results of this technique could be misleading. The other strategy is to estimate a VAR in first differences but including the error correction term derived from the residuals of the cointegration equations shown in Table 6, in a sort of an ad hoc or modified Engle-Granger procedure. We take the second road here.

The estimation of these VEC models (applied to models 2 and 4) allows two types of results. First, it permits a look at the response through time of private savings to shocks in the remaining variables in the system, by way of the impulse-response functions (IRF). And second, both IRFs and forecast variance decomposition (FVD) exercises would provide more information on Granger-causality relationships. As is well known, however, caution is needed because both IRFs and FVD are sensitive to the ordering of variables in the system if these variables present significant contemporary correlation.

The estimated VEC models (not shown) in general confirm the presumption that there is a weak feedback from voluntary private saving to foreign saving and to domestic saving. In particular, the coefficient of the lag residual coming from the cointegrating equation is not significantly different from zero in the VAR equations for variables other than the one for voluntary private saving. In the case of the relationship between VPS and growth, the feedback is stronger, as illustrated in Table 8, where the variance decomposition of these two variables clearly indicates mutual causation. However, a simple calculation of which influences the other most, shows a slight inclination toward the option that growth Granger-causes savings.

Based on this weak evidence, we show in figures 9 and 10 the effects of shocks to foreign saving, government saving and growth of voluntary private saving. These responses confirm previous results in which savings reacts negatively (and significantly) to positive shocks in foreign saving and government saving, and positively to shocks in growth. The latter effect could be overestimated, though, as there is feedback between growth and private saving. The other salient aspect is that the responses of private savings are rather shortlived: very strong in the first two years and practically zero thereafter. This again agrees with our previous result, in which 90% of the adjustment between short run and long run was found to occur in about three years.

5. Comparing Two Significant Episodes

We started this paper alluding to the outstanding economic performance of the Chilean economy in the last ten years. However, the take-off that began around 1985-86 was not Chile's first attempt to get into a sustained growth path by means of liberalizing and restructuring the economy. Indeed, between 1974 and 1981 the government implemented the bulk of the structural reforms that later were adopted by most other countries in the region: opening the economy to world trade, financial market liberalization, large-scale privatization, macroeconomic stabilization, state shrinking, tax reform, price deregulation, etc. As a result, economic growth quickly picked up in 1976 after a deep recession in 1975, and remained over 7% per year until 1981. Concurrently, investment ratios were up (they reached 26% in 1981), government saving was 8.5% of GDP in 1980, exports were diversifying and rising (in spite of an accelerated real peso appreciation), unemployment was declining, and inflation was receding. Some foreign observers were talking about a so-called "Chilean miracle." And then, starting in mid 1981 and over the next 18 months, the economy collapsed. By 1983, GDP had declined more than 16%, the economy was in deep recession again, and everything was apparently going wrong.

[27]Of firms that had been previously nationalized by Allende.

Why then has the second attempt that initiated around 1985 apparently succeeded? As it is evident in Table 9 below, which characterizes both episodes, the main differences rest on rows 6 to 12. At first sight, figures 12A - 12C tend to indicate that the most notorious difference lies in the different evolution of foreign saving. But certainly the story has more components. For example, let us assume that foreign saving is essentially exogenous; at the beginning of each episode, the economy starts to recover from a deep recession and investment follows suit, but with a lag. How is the increasing investment financed? In the 1975-81 episode, it was financed directly from credits from abroad at a time when Chile started to open up its capital account and creditworthiness was gradually restored. Foreign saving also served an increase in consumption, especially of tradable goods as the real exchange rate appreciated, tariffs were reduced, and inflation receded. Other reasons for increased consumption: adjustment of stocks of durable goods (particularly imported) as their prices went down; perception of an increase in permanent income as the "boom" momentum was strongly orchestrated by an authoritarian government; loosening of borrowing constraints after financial liberalization (amexcess of credit was created by banks in an environment of loose regulation); etc. What detonated the crisis? The abrupt cut in foreign inflows, after the current account deficit reached a record 12% of GDP in 1981.

In the 1985-91 episode, the increase in investment that followed the economic recovery could not count on increasing foreign credits because all international creditors wanted to run away from Chile. At the same time, firms could not get credits in the domestic financial system, which was half broke, faced with a much stiffer regulation than before, and had just learned the hard way the problems of being lenient. So there were two alternatives: reinvest profits (which might have been possible as the economy recovered); and get some resources from the growing pension funds. The former alternative could be attractive if corporate income taxes were reduced to below personal income tax rates. But not all firms were seeing their profits grow? The most likely to see increasing profits were those in tradable activities, which were favored by a high real exchange rate. Did these firms have more chances to generate rents, and higher profits than nontradable activities, and so potentially save more? More research at the micro level was needed here, but certainly there were some tradable sectors, especially those related to natural resources, that had important rents and thus the potential to save more. It was not strange that the conglomerates that emerged in this episode were the ones linked to the exploitation of natural resources (forestry, mining, fishing, exportable agricultural products), since these firms historically, had relied less on debt to expand.

What was the exact contribution of some of these factors to the happy ending (so far) of the second episode? Preliminary exercises are shown in figures 11 and 13. Figure 11 represents a historical variance decomposition exercise based in a VAR with the system of variables of model 2 above. This exercise projects the evolution of private saving for the 1985-91 episode with information up to 1985. Then, it asks what proportion of the difference between that base projection and the actual evolution of private saving was due to the actual shocks to each of the variables in the system. As it turned out, the two most important shocks were foreign saving and growth, which jointly explained

[28]This is an assumption very close to reality at times. See Morande and Schmidt-Hebbel (1978).

[29]See Morande and Schmidt-Hebbel (1978) for a complete account.

close to 70% of such a forecast error by the end of the episode.

Figure 13, on the other hand illustrates the effect of the pension funds dummy on the forecast coming out of the error-correction estimation for model 2, above. FORVPS is within the sample forecast of private savings out of the EC model 2 for the 1986-95 period; FORAD is the same forecast but with the effect of the pension funds dummy subtracted; and FORVSP1 is the forecast with the EC model estimated without the dummy. Tentatively, the effect of the pension funds dummy should be placed between the distance FORVPS-FORAD and the distance FORVPS-FORVPS1, which seems to be important in the early stage of the period under analysis; that is, exactly in the 1985-90 episode.

6. Concluding Remarks

There is no question as to the relevance of foreign saving to both the evolution of private saving and to the economy as a whole. It was the abrupt end of capital inflows and thus of foreign saving that ended the first boom episode in Chile. Foreign creditors panicked in 1981 when the current account deficit reached a 12% of GDP ratio and was clearly on the rise at a time when Mexico declared a moratorium on its debt. The Chilean economy simply could not cope with a reduction in resources for spending of such magnitude, because domestic saving was already too low.

The second boom episode succeeded and has endured until today, even after foreign capital inflows came back massively in the early 1990s. It is as if foreign saving suddenly ceased to be exogenous (capital inflows having resulted in huge foreign reserve accumulation and increases in domestic public debt). Why is it that now private domestic saving seems to be less subject to be crowded out by foreign saving (or capital inflows)? The key could be a mix of sustained growth of GDP (as could be inferred from our empirical results) and the existence of a deep capital market accruable to large pension funds, jointly with a tax structure that penalizes spending and favors (corporate) saving. Macroeconomic stability is taken as granted. The last two elements, however, do not become clear from the aggregate data we have used here. Future research should concentrate on microeconomic studies, especially at the corporate level.

It is difficult to draw some lessons from Chile's successful second episode that could be extrapolated to other countries. At first, one is tempted to say that Mexico 1990-94 and Argentina 1991-94 resembled much more closely Chile's first episode, when the expansion was fragile and dependent on foreign saving. But many of the remaining conditions could have been much different, for better or for worse. For example, 1995 was a year of world economic expansion, while the early 1980s were years of world recession. This, plus many other things, of course, would have helped an intelligent administration of the crisis in the case of Argentina (although not in Mexico). But not only external conditions are important; initial conditions are also crucial. Part of the increase in private saving in Chile's second episode could be attributed to much tighter borrowing constraints than in the first episode, precisely because of the big financial crisis that loose financial regulation and lenient financial practices had created. Finally, even though government saving has a negative effect on private voluntary saving, first, that effect is much less than 100%; and second, during the 1980s the government made a big saving effort to finance the pension system reform, which partially shows up in the compulsory portion of

[30]This figure could be an overestimation, since the effect of the shock on growth is somewhat contaminated by the feedback it receives from private saving.

total private saving.

In the end, policies should not be much different from what they have been until now in most of Latin America. They are to promote growth in the medium and long run, and that is essential for saving and further growth. However, something can still be done to reduce short-run fragility stemming from high dependence on foreign saving. Key policies should promote a very articulated and prudent financial regulation policy seems key (as the Mexicans have discovered recently), a tax structure inclined to spending rather than income, and long-term capital markets (perhaps through a pension system reform). And if possible, capital should be sterilized (which would be easier if there were institutional investors willing to buy domestic debt). But be aware that both pension system reform and sterilization of capital inflows require a low initial public debt ratio and a big fiscal effort. The latter, in times of recession, could exacerbate the economic downturn, making the decision much more unpopular. But in the end, who said there was such a thing as a free lunch?

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[31]On the other hand, our measure of domestic saving is not considering the quasi-fiscal deficit of the Central Bank, which at its highest point reached close to 5% of GDP. But again Chile was "lucky" enough not to have a large public debt to begin with (actually, it was virtually zero); so that quasi-fiscal deficit was easylly accommodated.

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GLOSSARY OF ABBREVIATIONS

GNSPC = Gross National Saving Per Capita
TPSPC = Total Private Saving Per Capita
VPSPC = Voluntary Private Saving Per Capita
GDPPC = Gross Domestic Product Per Capita
FSPC = Foreign Saving Per Capita
GSPC = Government Saving Per Capita
GDIPC = Gross Domestic Investment Per Capita
GDPPCSM = GDPPC exponentially smoothed

GNSRATE = Gross National Saving Ratio (as % of GDP)
TPSRATE = Total Private Saving Ratio
VPSRATE = Voluntary Private Saving Ratio
GDP = Gross Domestic Product
FSRATE = Foreign Saving Ratio
GSRATE = Government Saving Ratio
GDIRATE = Gross Domestic Investment Ratio
GDPSMRATE = GDPRATE exponentially smoothed.

GROWTH = Growth Rate of GDP
TT = Terms of Trade
INF = Inflation Rate (annual average)
M1RPC = Real M1 Per Capita
DUMTAX = Dummy for tax reform
DUMPF = Dummy for pension funds building-up
D