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Countries in the hamster's wheel?: Nurkse-Duesenberry demonstration
effects and the determinants of savings

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¿Países en una rueda de hámster? El efecto demostración de Nurkse-Duesenberry y los determinantes del ahorro.

Andrés Rius*
Carolina Román†

Resumen

El comportamiento de las tasas de ahorro a lo largo del tiempo, así como la comparación entre países, permanece como un puzzle aún sin resolver, tanto para la academia como para los hacedores de política. Si bien, cierta evidencia señala que el ahorro suele ser un resultado del crecimiento, más que un determinante, en el largo plazo es muy difícil pensar que un país alcance un crecimiento sostenido si la tasa de ahorro doméstico permanece sistemáticamente por debajo de sus niveles de inversión. Este artículo propone contribuir en este campo. Explora el rol que juegan un conjunto de factores derivados de la literatura sobre economía comportamental que permiten complementar los aportes de las teorías macroeconómicas sobre los determinantes del ahorro. En particular, en este artículo se revisita la hipótesis de que, así como se encuentran comportamiento emulativos entre consumidores, es posible explorar la existencia de patrones de emulación internacionales (entre países). Así, la interdependencia se explica porque los individuos toman sus decisiones de consumo en base a su ingreso relativo, más que absoluto, incorporando información sobre las pautas de consumo de los países ricos, cuyo efecto es aumentar la propensión a consumir y, por ende, disminuir las tasas de ahorro. Este trabajo propone testear el efecto demostración internacional sobre las tasas de ahorro a partir de un análisis de datos de panel para un conjunto de 169 países en las últimas décadas (1980-2013). Para esto propone dos medidas de exposición a pautas de consumo globales -la tenencia de TV y el uso de internet-. Los resultados de las estimaciones aportan evidencia a favor de la existencia del efecto demostración, y la misma es más robusta cuando se utiliza internet como medida de exposición. Además, en el trabajo aportamos un conjunto de conjeturas sobre los mecanismos que explican estos resultados.

Palabras clave: ahorro privado, efecto demostración, economía del comportamiento

Código JEL: E21, E71, o16

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Countries in the hamster's wheel? Nurkse-Duesenberry demonstration effects and the determinants of savings.

Andrés Rius
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Abstract

Throughout the world, stable regional patterns of private savings are hard to come by. For example, Latin America's saving rates have been, for a long time, below those of countries with similar levels of development. Those same savings rates have been growing lately, in almost as intriguing manner. These stylized facts remain intellectual puzzles and development policy challenges. In addition, while it may be true that savings often seem to follow rather than lead the growth process, it has been shown that in the long run, it is not possible to grow sustainably with domestic savings persistently below investments. For these and other scientific considerations, understanding the determinants of savings is an important research objective that has previously escaped analysts that tried to make sense of results from varied, distinct models. This article explores one set of variables much aligned with the rise of behavioral economics, which could add to the literature on the macroeconomics of savings. Specifically, the article revisits the hypothesis that, as there is evidence of emulation patterns between consumers, there might be international (macroeconomic) "emulation". The interdependence would arise from consumers basing their consumption decisions on relative rather absolute income, their choices incorporating increasing amounts of information about consumption standards in rich countries, and this pushing up propensities to consume and down savings ratios. We test demonstration effect theories exploiting recent international data on savings, incomes, and means of exposure of global consumers to the evolution of savings patterns. With the resulting country panels, we find some evidence in favour of demonstration effect for the period when television was spreading around the world and much consistent with the same effect for the more recent times when the Internet was rapidly becoming a preferred means of discovering foreign consumption standards. We speculate about the conjectural mechanisms that could make sense of the results.

Keywords: private saving rates, demonstration effect, behavioral economics

JEL Classification: E21, E71, o16

1. Background and motivation

For a long time, the international pattern of aggregate savings has puzzled analysts and scholars. For example, since there are reliable statistics, Latin America's saving rates (i.e., total savings over GDP) have been consistently below those of countries with similar levels of income (Edwards, 1995; Reinhardt, 2008; Grigoli et al. 2014). This result persists over time and has become an intellectual puzzle as well as a policy challenge. Regarding the latter, while it may be true that savings often seem to follow rather than lead the growth process, it has been shown that, in the long run, insufficient domestic saving can act as a constraint on growth. Considering lingering uncertainties, various forms of market failure, and the complexities of international policy coordination, it is not too surprising that many investors from the global North choose to invest "close to home" (Bresser-Pereira and Nakano, 2003). This behavior could explain the high statistical correlation between countries' aggregate investment and domestic saving rates (Feldstein and Horioka, 1980; Apergis and Tsoumas, 2009). At the same time, the observed regularity depicts a global economy where neither net borrowers (typically capital-thirsty, investment-constrained developing country governments and companies) nor major global investors get the amounts of funds and levels of returns they and their clients expect.

Just as the "Feldstein-Horioka puzzle" exposes some of those weaknesses of the neoclassical theories of investment (with implications for savings-promotion policies), empirical studies of savings *variations* across countries provide insights on the *drivers* of consumption. Still, despite the time elapsed and efforts made, a general, encompassing framework is lacking (Edwards, 1996; Loayza et al. 1998b, Loayza et al. 2000, 2001; Grigoli et al. 2014).³ The theory of savings has traditionally been subservient to (i.e., derived from) the theories of consumption. It would not be an overstatement to say that, along with the latter, the theory of savings was at an impasse until the rapid expansion of Behavioral Economics (BE) in the last two decades (Deaton, 1992, 2009; Thaler and Sunstein, 2008).

For the study of savings, BE has been like a blow of fresh air, as research programs flourished pursuing the familiar strategy of revisiting old models with a set of new, empirically-grounded assumptions. In exchange, BE found a trove of questions and puzzles starting to coalesce around key hypotheses. BE has generated numerous insights, including those that could start to address gaps in the theories of consumer behavior and would explain savings. In this article, we focus our attention on one crucial deviation from conventional consumption theory; namely, *interdependent preferences*. Moreover, we focus more narrowly on consumption and savings at the aggregate international level; that is, mostly investigating countries as the units of analysis.

Interdependent preferences have been studied for quite some time, and some of the key contributors have become prominent due to their determination to challenge established thinking, and to work out the implications of their alternative models. As some observers have pointed out, behavioral economics more broadly belongs to a class of research strands that had their rebellious times and now seem to be converging to be part of a new orthodoxy (Davis 2008). In other words, diehard "bounded rationality scholars" associated with them could be forgiven for not appreciating the *novelty* of the emerging consensus, since they were making a living by challenging the orthodoxy well before the discipline decided to distinguish them as

³ The most similar equivalents for Latin America are Gutiérrez (2007) and, Cavallo and Serebrisky (2014).

mavericks rather than fringe scholars.⁴ Others will more generally embrace the new realities, taking advantage of this “progressive” moment (in terms of Lakatos) to explore grounds opened by the accumulation of refutations afflicting the old programme.

As it befits a “progressive” research programme, BE is at the stage of demonstrating its encompassing” power; or, that is, competing to show that it can answer a broader set of questions than the alternative programs. New BE models seek to establish regularities from the lab and the field (Frank, 1997; 2005; Bagwell and Bernheim, 1996; Easterlin, 1974; 1995; Goodwin et al. 1996). They aim to derive the implications of partial replacement of neoclassical assumptions (Leibenstein, 1950; Castilla, 2010; Rojas and Jiménez, 2008; Rojas, 2008).

Partly stimulated by the success of current BE stories, we offer a “prequel” to the current wave of paradigm shifting, which takes us back roughly to the end of the Second World War. Thus, from the variety of behavioral patterns identified by BE, we probe more deeply the possibility of observing, at a macroeconomic level, empirical regularities that are consistent with the individual/household patterns of emulative consumption. The latter were most consistently exposed by the likes of Ragnar Nurkse and James Duesenberry, who spoke explicitly about a “demonstration effect” linking individuals’ choices through comparisons and consumers’ desire to access the living standards of those better off. More specifically, as Nurkse puts it, “When individuals come into contact with superior goods or spending patterns, they are apt to feel a certain tension and restlessness: their propensity to consume is increased.” And attributing it to Duesenberry, (citing the latter’s *Income, Saving and the Theory of Consumer Behavior*), Nurkse observes “That [...] individuals’ consumption functions are interrelated rather than independent helps to account for certain facts that have seemed puzzling (...) in particular, the choice between consumption and saving.” (Nurkse 1953: 577-78).

Nurkse (1953), who saw a direct link between consumption patterns and the problem of capital formation, writes casually about the extrapolation from a plausible model of individual behavior to the dynamics of macroeconomic aggregates. Research labeled “representative individual” has set off the alerts and prevents us, in our times, from taking those statements lightly.⁵ We shall return to these issues below when we examine the results of our econometric study.

The study of aggregate private savings is inevitably constrained by the quality of available data. Many countries keep up to date national macroeconomic accounts today. By taking away current consumption from current income, they get rudimentary savings statistics. Fewer countries are capable of breaking it up into government and private savings; a very small group undertakes surveys of household finances with some frequency. These, which are the accepted international best practice for estimating savings with sound microeconomic data, are available only to a small group of countries, typically those that have functioning oversight institutions in the financial sector, that creates the demand for data and contribute resources needed to justify and defend the provision of such public good.

The paucity of those surveys is a serious obstacle for those wanting to tackle some the substantial issues of interest. Confronted with such challenges, we adopt a pragmatic approach, going ahead to exploit the available data while acknowledging the studies’ limitations. Studies such as those by Cavallo and Serebrisky (2016) are good examples of what should become more

⁴ The canonical figure was, Herbert Simon and his research agenda centered on the behavior of individuals and productive organizations (Simon 1957; 1976; Smith 1982) is likewise acknowledged as key contributor to the experimental branch of limited rationality.

⁵ Writing about the individuals level demonstration effect declares: “These forces, *it seems to me*, affect human behavior to a certain extent in international relations as well.” (Nurkse 1953: 578; emphasis added is about all there is in the article to justify leaping from many individuals to one representative individual).

widespread; that is, the integration of macro and micro data. In the meantime, while these studies become more prevalent, we maintain that there are still substantive issues that can be analyzed with the available data. In particular, despite the difficulties, we manage to compile a panel containing 5.577 observations from 169 countries followed over a period of 33 years (a detailed discussion of data issues is a contribution of the article.)

The rest of the paper is structured as follows. In the next section, we describe some stylized facts about saving across countries and regions, based on the available empirical record. In section 3, we discuss alternative explanations (“mechanisms”) that may account for a demonstration effect at the countries level. Section 4 presents the methodology for our analysis, describing the data and the estimation model based on panel data techniques. Section 5 discusses the main results that nurture our confidence in the interdependence hypothesis, and the corresponding caveats. We close by summarizing conclusions and elements for a research agenda.

2. Stylized facts about saving across countries

Saving rates do vary across countries and time (Edwards 1995, Loayza et al. 2001, Grigoli et al. 2014). Since the 1960s, there has been a process of divergence among saving rates, in particular among the developing countries: while saving has remained higher in East Asia, it stayed stagnant in Latin America and had not improved that much in Sub-Saharan Africa. For instance, saving rates in East Asia and Pacific barely fluctuated around 33,2% of GDP, and Latin America and the Caribbean have experimented historically low domestic saving rates, on average around levels of 21,1% of GDP between 1960 and 2015 (Table 1). Meanwhile, the high-income countries (except the United States) have remained, on average, among those with the highest saving rates, though the mortgages crisis disrupted that order allowing East Asia to improve its figures in relative terms.

Table 1. Gross domestic saving as a percentage of GDP (%)
by regions and income levels by decades (1960-2015)

Regions	1960-1970	1970-1980	1980-1990	1990-2000	2000-2015
East Asia and Pacific		32,1	32,6	33,8	33,9
Europe and Central Asia	27,5	25,2	22,9	23,6	23,5
Latin America and Caribbean	20,4	22,1	22,7	19,4	20,9
The Middle East and North Africa	32,9	37,6	21,7	24,2	36,3
North America	23,7	22,8	21,7	20,3	17,6
South Asia	13,2	15,2	18,3	21,5	27,5
Sub-Saharan Africa			18,8	16,9	19,2
Income levels					
High income		26,1	24,0	23,6	22,2
Low and middle income	21,1	26,2	27,0	27,9	31,4
Low-income			4,3	4,9	7,4
Middle-income		26,3	27,2	28,1	31,7
Lower middle income	13,1	18,1	20,5	21,3	24,4
Upper middle income	23,3	28,6	29,1	30,0	33,7
World	23,6	26,1	24,8	24,8	24,9

Sources: Own elaboration based on World Development Indicators from World Bank

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A lot has been written about Latin America's aggregate underperformance, and we do not have the space or scope to add much in that regard; however, a quick look at the savings

challenges in the region confirms that inadequate savings can still stall incipient growth despite the combined efforts of local policymakers and international institutions. In the region, it has been argued that, despite the financial reforms of the nineties and the macroeconomic stability achieved by a great number of these countries in the last decade, savings have stayed quite stable and remained lower than in other regions, especially compared to East Asia (Gavin et al. 1997, Gutiérrez 2007, Reinhardt 2008, Cavallo and Serebresky 2016). Empirical research supports the Feldstein and Horioka (1980) hypothesis for most Latin American countries, implying that growth may be constrained by investments that in turn are hampered by low domestic savings (Gutiérrez 2007). This reliance on foreign markets brings up more vulnerability to the Latin American economies, which are in that way attached to highly volatile processes.

During the nineties, several studies focused on the long-run disparities in saving rates, seeking to identify levers for public policy. Some of those studies were outcomes of the World Bank's project "Saving across the world", which contributed a database covering over a hundred countries (developing and industrialized), and a time span of over three decades (1960-1994). The studies linked to the database include Schmidt-Hebbel and Servén (1997), and Loayza et al. (1998, 2000, 2001).⁶ Loayza et al. (2001) summarize the main empirical findings of the group of contributions and highlight some stylized facts that stand out for that period. These state that there is a positive correlation found both in longitudinal and in cross-section samples, between saving rates and income levels. In addition, this positive correlation is also found between saving rates and income growth (i.e., those economies with higher income growth have higher saving rates) though this relation is stronger for the industrialized countries. This fact has been explained by the virtuous cycles of saving and prosperity, in one case, and by low savings and poverty traps, in the other, evoking Kaldor's contributions on the matter. Another fact that those studies showed was a positive correlation between saving and domestic investment, confirming the Feldstein and Horioka (1980) thesis. In the same vein, Grigoli et al. (2014) present new evidence on the behavior of saving across the world that confirms some of the previous results and brings new findings. More recently, the Inter-American Development-Bank published a group of studies edited by Cavallo and Serebrisky (2016) that analyzed the role of saving for development, worried about the low saving rates of Latin America and the Caribbean

Among the empirical studies based on cross-country data, some of them have focused on national savings, while others go further and disaggregate private and public saving. Loayza, et al. (2000) use data on 69 industrialized and developing countries for 1965-1994 to explain national, private and public saving. Edwards (1996) analyzed the determinants on private saving for 36 industrialized and developing countries for 1970-1992. Gutiérrez (2007) focused on national saving in 9 Latin America countries for a period after mid-1990, and also distinguished within the private sector between household and enterprise savings. Reinhardt (2008) studied the domestic savings among middle-income countries during 1976-2000. Freytag and Voll (2013) used a cross-country sample of 60 developing countries and emerging economies from 1980 to 2007. Grigoli et al. (2014) bring evidence for a large period, 1981-2012, that covers 165 countries. They analyze the determinants of private and national savings and distinguish household and corporate savings. In other papers, these authors focus on Latin America and the Caribbean (Grigoli et al. 2014). Becerra et al. (2015) also analyzed the Latin American private saving regions finding evidence that reinforced the low saving pattern that characterized this developing region. The main findings of the empirical research on private saving are described in Table 2.

Table 2. Determinants of private saving and empirical evidence

⁶ A description of the database may be found in Loayza et al. (1998a).

Variables	Expected effect on private saving	Empirical evidence
Persistence		High serial auto-correlation in the saving rates. Loayza et al. (2000) Reinhardt (2008) Grigoli et al. (2014).
Current income	According to the Keynesian consumption function, we will expect a positive effect of income on saving.	The positive effect of per capita income on saving rate in the short run. The relation is more robust and important for the developing countries than for the developed (Edwards 1995, Loayza et al., 2000 y Reinhardt, 2008). In the long run, the income increase will happen together with demographic changes and urbanization, which tend to reduce saving.
Income distribution	A positive effect of income concentration on saving is expected. The wealthier persons should save a bigger proportion than those of less income (considering saving as a "superior good"). Saving depends on income functional distribution (For instance, as Kaldor argue), and/or personal income distribution.	There is no significant effect for some authors (Edwards 1995), while Gutiérrez (2007) found a positive one.
Transitory and permanent income	According to Friedman hypothesis on permanent income and the life cycle of Modigliani, we will expect that permanent shocks on income will affect consumption while those transitory will increase saving.	Some evidence tends to reject the permanent income hypothesis; the positive impact of transitory per capita income increase on saving is higher than the effect of the increase of permanent income (Loayza et al. 2000). Other studies find a significant effect of the permanent component of income (Grigoli et al. 2014).
Economic growth	The effect of growth on saving is ambiguous. Following the permanent income theory, economic growth will mean more income in the future and therefore will reduce the current saving. However, in the life cycle model, the effect will depend on the cohorts that become positive affected by the income growth and of the liquidity restrictions. Therefore, the effect is still debated (e.g., Gavin <i>et al.</i> 1997).	According to the panel data results, there is a strong relation between saving rate and per capita income growth (Edwards, 1995; Loayza et al. 2000; Gutiérrez 2009, Grigoli et al. 2014).
Demography	According to the life-cycle hypothesis, consumption and saving pattern follow an inverted-U. Therefore, the active people will save more, and the aged-people and the youth will save less.	The results are controversial. Saving rates are not too high during the active age. Retired people save, or un saves much as it is expected theoretical (Loayza et al. 2000). However, it seems there is a negative relationship between the dependence rate of the young people and the elderly, and the private saving rates (Edwards 1995, Loayza et al. 2000, Grigoli et al. 2014).
Uncertainty	We will expect higher saving when there is more economic uncertainty based on the assumption that the consumers are risk averse and will diminish their savings kept for precautionary motives.	Usually, inflation is used as an indicator of macroeconomic uncertainty and the effect on saving should be positive Loayza et al. 2000, Gutiérrez 2007, Grigoli et al. 2014) but sometimes it does not appear to be significant. (Edwards 1995; Reinhardt

		2008).
Institutions	Institutions may influence the individual and national savings.	Better economic institutions drive aggregate savings formation upwards Freytag and Voll (2013)
Policy		
Public saving	According to the Ricardian Equivalence, there is a trade-off between an increase in government saving and a reduction in private saving.	There is a negative effect of public saving on private saving, but with a coefficient less than unity (Edwards 1995, Loayza et al. 2000, Grigoli et al. 2014)
Tax incentives	The private saving elasticity to the net rate of return (after taxes) is not clear due to the compensator between substitution and income effects.	A positive but small effect of tax incentives on saving has been found in some research works. In addition, in the short run, they have a negative impact on public saving
Reform of pension system	Changes towards an individual capitalization regime may have a positive impact on saving.	The impact of the pension reforms depends on how the deficit of the transition towards the new system is financed and, on the efficiency, benefits obtained.
Financial liberalization	In the short run, there is a negative direct effect (through prices (interest rates) and quantities (private credit expansion), but in the long run the effect turns to be indirect and positive (from capital accumulation and economic growth).	Interest rates do not show statistically significant results on saving or the results are not consistent with what is theoretical expected (Edwards 1995, Loayza et al. 2000, Gutiérrez 2007, Reinhart 2008, Grigoli 2014). There is some evidence of the negative short-run effect due to the credit expansion.
Foreign deficit and foreign aid.	There is no consensus about the effect of foreign saving on national saving.	Some works find a trade-off between foreign saving and national saving (Edwards 1995, Loayza et al. 2000). About foreign aid, the results are ambiguous, because, in countries with increasing saving rates, the foreign aid has been associated with higher national saving (Rodrik 2000)

Sources: This synthesis is mostly based on Loayza et al. (2001) and the following references: Edwards (1995); Loayza et al. (2000); Reinhart (2008); Gutierrez (2007), Freytag and Voll (2013), Grigoli et al. (2014), Rodrik (2000).

Most of these empirical studies agree on some key determinants to explain the difference between national and private saving rates. Variables such as economic growth (per capita income growth), income level and public saving (possibly capturing a partial Ricardian equivalence) may have important impacts on increasing saving rates. Empirical works do not generally support the effect of macroeconomic uncertainty. There may exist some trade-off between external and domestic saving, but it is not complete. There is not conclusive evidence on the life cycle hypothesis: in some cases, the dependency rate appears to be negatively related to savings, but in other studies, the result is not significant. Finally, the interest rate, the soundness of the financial system and income distribution show ambiguous results. More recently, some authors introduce the effect of institutions on savings in developing and emerging countries, finding a positive relation between saving and the “quality” of institutions suitably defined and measured (Freytag and Voll, 2013)

The literature just synthesizes some interesting insights but, as a whole, it still has not reached satisfactory outcomes. Only a few factors appear consistently to be robust determinants

of the differences among countries. Advancing in identifying key factors and coherent sets of mechanisms that could account for them is of great importance from the policy as well as scientific perspectives.

The meticulous work undertaken by the research teams that have investigated these issues suggests that significant advances in the understanding of savings may not occur by traveling the same beaten paths. In this paper, we propose to recover a hypothesis with a respectable pedigree that has not been so thoroughly examined in recent times and explore its empirical plausibility. The relative income or demonstration effect theses introduced by Duesenberry (1949) and extended later by Nurkse (1953) becomes a strong candidate framework to shed new light in a field that may be needing it.⁷

3. The demonstration effect: mechanisms

From a development perspective, it is worth exploring the mechanisms that could logically connect demonstration effects with chronic lack of private savings. Filgueira (1981) was among the keen observers that noticed that the Latin American puzzle was not unrelated to the consumption bias of the economic booms of the 1970s. The latter were mostly consumption booms in those countries (as opposed to fundamentally investment-driven booms), and the behavior of consumers revealed extraordinarily high discount rates that explained the extended use of credit by households, to buy *conspicuous* durable goods.

Demonstration effects have points of contact with related concepts and research programs that should be acknowledged. In chronological order, Thorstein Veblen's theory of conspicuous consumption (introduced in his 1899 *Theory of the leisure class*) rests on the observation that goods have a ceremonial or symbolic value in addition to their instrumental value. At any point in time, there would be an appropriate level of ceremonial goods used or consumed, for each group in society, and consumption of those goods would signal one's or a group's rank in society. Veblen's institutionalist theory rejects optimizing rationality, regardless of its broader influence beyond institutionalist circles.

About fifty years later, James Duesenberry found a puzzle in the declining aggregate savings rates that accompanied the growth of income in the US soon after World War II (Duesenberry 1949). The expectation was that savings and income would move in the same directions, but that was not what the data was showing. He then observed that the hypothesis of emulative consumption would solve the puzzle. The upward imitation of relatively poorer consumers, of the patterns of expenditures made by the relatively richer, constitutes an interdependence mechanism that could explain the savings gap. Nurkse argued that the imitation was driven by the aspiration to enjoy experiences previously restricted to the relatively richer. Confronted with incomplete information about the real worth of consumer goods, consumers would be guided by the rich's choices to infer what they should be buying. Nurkse also laid down two features of *international* demonstration effects that may be taken to be part of "the mechanisms". "One is the size of the gaps in real income and consumption levels. The other is the extent of peoples' awareness of them." And, to leave no doubts: "The leading

⁷ Some authors have started to explore partial or more fundamental innovations. For instance, Lahiri and Caines (2013) endow agents with recursive preferences, in order to explain savings. Our approach is more modest, and it consists of merging the relative consumption and demonstration effects hypotheses with the broader empirical analyses of saving.

instance of this effect is at present the widespread imitation of American consumption patterns.” (Nurkse 1953: 578).

The research community did not immediately jump to embrace Duesenberry’s model; a model that could demonstrate that, under interdependent preferences, progressive income tax rates were Pareto efficient. Duesenberry’s model was not a usual feature in microeconomic textbooks until recently. With the *Great Recession* of 2007-2009, many authors from varied persuasions have given renewed attention to the peculiar syndrome of (i) falling households’ savings, (ii) large accumulation of debt, (iii) growing use of debt to finance consumption and (iv) raising inequality; all apparently connected to the aspiration to “keep up with the Joneses” (Frank, 2005; 2011, Ray 2011).

Halfway through this journey, we shall encounter Jeffrey James’s (1987) analysis of Veblen’s vs. non-Veblenian models of interdependent preferences. He shows that unlike Veblen’s framework, Nurkse’s and Duesenberry’s rest on the information consumers receive about the features of goods consumed and the “restlessness” those consumers experience when they are made aware of the superior qualities of goods purchased by others with a higher status in society. Product variation and the needs “created” by advertising in its “informational” role, remain crucial to the work of these mechanisms that have the potential to shape industrial structures, prompt innovation, and –more important for our purposes here—become determinants of aggregate savings and inequality.

4. Methodology: Data and empirical model

Our empirical approach is based on a cross-countries analysis with the main purpose of identifying the main factors that explain the inter-country variation of private saving rates with special attention to variables that reflect the presence of emulation patterns effect affecting saving decisions.

A panel data analysis is used which include cross-section data for 169 countries from all over the world; with information from 1980 through 2013. We use a model based on linear regression with individual effects in the base, and we run panel data estimations, using different alternative specifications (fixed effects, random effects, and dynamic estimators).

4.1 Data and sources

The dependent variable is the rate of gross private saving (PS) as a percentage of gross domestic product (GDP). Private saving is computed as the difference between the ratio of gross national saving and government savings (as a percentage of GDP).

The explanatory variable includes two types of effects. On the one hand, we rely on a group of variables that have been widely used in empirical works exploring the effect on the private saving of those factors, which drives directly from the standard theories briefly discussed in the previous section. First, we include the growth rate of per capita GDP as a measure of economic growth and constant GDP per capita (in logs) to evaluate the effect of income levels. The public saving rate (actually, we used the general government saving as a percentage of GDP) allows us to test the partial Ricardian hypothesis. The foreign saving rate (measured as the

deficit current account balance as a percentage of GDP) is included to look for the tradeoff between private and foreign saving. Macroeconomic uncertainty is reflected using the inflation rate as the annual variation of the consumer price index.⁸ Financial depth is measured as the ratio of money and quasi-money (M2) to GDP. The real interest rate is calculated by adjusting the deposit interest rate by the inflation rate. Income distribution is measured by the GINI index. The life-cycle hypothesis is tested by introducing two demographic dependency rates: the young age dependency rate and the old age dependency rate. This distinction aims to capture the diverse place of the countries in the demographic transition. We calculate the young-age dependency rate as the ratio between those younger than 14 to the people within 14 and 65 and the old-age dependency rate as the ratio between those people above 65 to the people within 14 and 65.

On the other hand, we need a variable, which reflects the mechanism of the demonstration effect. Based on the theoretical definition of the demonstration effect as explained by Nurkse (1953) and applied by Filgueira (1981) to explain the Latin American economies, and the empirical research by Schor (1998)⁹, we use the number of TV set per 100 inhabitants as a measure of the knowledge of the disparity between consumption levels among countries. We also used another indicator to measure the exposure to other consumption patterns that is the internet users. This variable is defined as the percentage of the population with access to the worldwide network. An important advantage of this type of information is its available to cover the sample and the period under study.¹⁰ The information on TV sets is available since the beginning of the period, and for most of the countries, the series covers all the period. As for the number of internet users, the database has more information since 2000, although there are some sporadic figures for some countries for the previous years. Using alternatively, these two variables, we aim to capture the exposition effect along the whole period under study. However, the characteristics of these two communication mediums are different if we think about the product lifecycle. TV sets is a widespread telecommunication medium since the 1980s, but the internet is a relatively new network communication medium.

In general, we used several sources to build the database: World Economic Outlook Database of the International Monetary Fund (WEO-IMF); the World Development Indicators published by the World Bank (WDI-WB); International Telecommunication Union of the United Nations (ITU-UN), and other national organisms when specific data for some countries was missing. Further details on the sources and definitions of the variables can be found in the Appendix.

4.2 Method

To study the private saving behavior of countries, we estimate a panel data with cross-section data for 169 countries from 1980 to 2013. The panel is unbalanced as not all data are

⁸ For those cases with negative rates, we replaced the negative value with an arbitrary figure, close enough to zero but strictly above zero (e.g., 0.01%), so we do not lose these observations. The decision is based on Ochoa and Orellana (2002). In addition, for very high inflation rates –hyperinflation–, over 10.000% we set the values on 10.000%. These episodes were the case of Republic of Congo in 1994 and Bolivia in 1985.

⁹ Schor (1998) used a Veblen-inspired study of the individual decisions on spending and found that those who watched TV more saved less, conditional on the other regressors. Taken from Oh et al. (2012).

¹⁰The data on the number of TV set and internet users was kindly provided by the International Telecommunication Union of the United Nations (ITU) for the elaboration of this article.

available for every country for every year. As a general decision, we include as many countries as we could, as long as there are least five observations per country.

The base equation explaining private saving as a percentage of GDP (ps_gdp) might be expressed as (Equation 1):

$$ps_gdp_{it} = \alpha + \beta_1 * lngdppc_{it} + \beta_2 * gdppcgrowth_{it} + \beta_3 * gg_gdp_{it} + \beta_4 * lninfl_{it} + \beta_5 * rdr_{it} \\ + \beta_6 * young_{it} + \beta_7 * old_{it} + \beta_8 * sext_{it} + \beta_9 * m2_{it} + \beta_{10} * gini_{it} \\ + \beta_{11} * \text{demonstration effect}_{it} + u_{it}$$

$$(i = 1, \dots, 169; t = 1980, \dots, 2013)$$

Where i refers to countries (the cross section dimension, t denoting years (time-series dimension), α is a constant and u_{it} is the error term. Then we have a group of explanatory variables with their respective parameters, β_1 to β_{11} , where:

- $lngdppc$ is the logarithm of real GDP per capita, adjusted by purchasing power parity (expressed in 2005 international dollars).
- $gdppcgrowth$ is the annual growth of GDP per capita (in percentage)
- gg_gdp is the general government saving (as percentage of GDP)
- $lninfl$ logarithm of the inflation rate (in percentage)
- rdr is the real interest rate (in percentage)
- $young$ is the young age dependency rate
- old is the old age dependency rate
- $sext$ is the external saving rate (as percentage of GDP)
- $m2$ is the financial depth (as percentage of GDP)
- $gini$ is the GINI index
- $demonstration\ effect$ is the demonstration effect

The error term μ_{it} include a country specific effect, μ_i , which is unobservable and the disturbance v_{it} . The individual effect is time-invariant and it accounts for any country specific effect that is not included in the regression. In some of the models we include time-dummies, λ_t , individual-invariant to account for time-specific effect that is not included in the regression. For instance, these time variables may control for those external shocks that may affect all the countries

$$\mu_{it} = \mu_i + \lambda_t + v_{it}$$

Depending on the assumptions we make about the behavior of the country effects there are different model specifications. On the one hand, the fixed effects model (FE) assumed that the explanatory variables be independent of the disturbance for all units and over time but correlated with the country effect μ_i . The disturbances stochastic v_{it} is independent and identically distributed IID $(0, \sigma_v^2)$ and the individual effects are considered as a group of N additional coefficients that are estimated together with β coefficients. This model relies exclusively on the time variation within the units. For this reason, the estimator is named the within estimator (Baltagi 2012).

On the other hand, in the random effect model (RE) the country effect μ_i are assumed as a random constant term over time and independent of the disturbance v_{it} and the explanatory variables x_{it} . In this case, the individual effect becomes part of the error component, and therefore, these models are also called random error components models.

The problem we face is to compare private rates that differ between countries and vary

over time within countries. Therefore, we run the panel data using alternatively fixed effects and random effects. Choosing between both models is not easy (Baltagi 2012). The basic difference between both models is the hypothesis of the no correlation between the regressors with the individual effects. The RE model assumes exogeneity of all the regressors with the random individual effects, while the FE allows for the endogeneity of all the regressors with these individual effects. We test this hypothesis using the Hausman test, which is based on the difference between the fixed and random estimators.

For those models, we use FE; we perform F-test to test whether the country effects are zero. A rejection of this hypothesis means that the fixed effects are not zero is not equal across countries. For those models we use RE, we perform the Breusch-Pagan significance test. Finally, in all the cases we use robust standard errors when estimating the coefficients.

In addition, other problems arose when working with economic relationships. The fact that these relationships turn out to be dynamic. In our model, it is plausible that exist some effect of the past saving behavior on the actual rates of saving, which converts the static model in a dynamic one (Loayza et al. 2000, Edwards 1996, Reinhardt 2008, Grig. et al. 2014). This dynamic relationship is characterized by the presence of a lagged dependent variable among the regressors (Baltagi 2012: p.147) (Equation 2):

$$\begin{aligned} ps_gdp_{it} = & \alpha + \beta_1 * lngdppc_{it} + \beta_2 * gdppcgrowth_{it} + \beta_3 * gg_{gdp}_{it} + \beta_4 * lninfl_{it} + \beta_5 * rdr_{it} \\ & + \beta_6 * young_{it} + \beta_7 * old_{it} + \beta_8 * sext_{it} + \beta_9 * m2_{it} + \beta_{10} * gini_{it} \\ & + \beta_{11} * \text{demonstration effect}_{it} + \beta_1 * ps_gdp_{it-1} + v_{it} \end{aligned}$$

$$(i = 1, \dots, 169; t = 1980, \dots, 2013)$$

To estimate the dynamic panel (Equation 2), we used the methods proposed by Arellano and Bond (1991) which was generalized and extended by Arellano and Bover (1995). First differencing and then using a generalized method of moment's estimator (GMM).

To implement the GMM estimators suggested by these authors, we ran the `xtabond2` command for stata programmed by Roodman (2009). Two lists of variables are needed for this estimation.¹¹ A group of endogenous variables that include income level, economic growth, inflation, real deposit rate, and is instrumented with GMM-style instruments, in this case, we use the second lag values of the variables in levels. The second group of explanatory variables includes all the strictly exogenous, and we assume the public saving, external saving, demonstration effect (TV and internet), old dependency rates and Gini index, so for these variables, the program will use them as their own instruments. We can rather use the Arellano-Bond difference GMM or the system GMM. The system GMM is a better method when the lagged values of the regressors are poor instruments for the first-differenced regressors. The system GMM estimator uses the level equation to obtain a system of two equations: one differenced and one in levels, and it usually increases efficiency.

Three additional tests are offered with the command `xtabond2`. Two diagnostics are computed using Arellano and Bond GMM procedure to test for first-order and second-order serial correlation of the residuals. One should reject the null of the absence of first-order serial correlation, and no reject the absence of second-order serial correlation. A special feature of dynamic panel data GMM estimation is that if T is large, the number of moment conditions increase. Therefore, the Sargan test is performed to test the over-identification restrictions. Too

¹¹ We follow Grigoli et al. (2014) to decide which variables are treated as endogenous.

many moment conditions introduce bias while increasing efficiency. Actually, stata reports the Hansen J statistic, instead, but keep the same null hypothesis that the instruments as a group are exogenous, and therefore we expect not to reject it.

4.3 Empirical results

Table 3 shows the correlation coefficients between private savings rates and its determinants. The descriptive statistics with the means and deviations for each variable is displayed in Table 4. Focusing on the private saving rate (as a percentage of GDP) the variation between the groups -countries- is higher than the dispersion within countries. The descriptive statistics of the other variables do not show a homogeneous pattern of dispersions. Some of them are more disperse between countries -such as income, financial depth, old and young dependency rates, TV sets- but others show higher within-country variation -for example, economic growth, inflation rate, real interest rate-.

Table 3. Correlation matrix.

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Gross Private Saving	1,00												
2 Gross National Saving	0,88	1,00											
3 GDP per capita, PPP	0,22	0,32	1,00										
4 General Government Saving	(0,11)	0,38	0,18	1,00									
5 GDP per capita growth	0,15	0,23	0,04	0,18	1,00								
6 Inflation rate	(0,00)	(0,03)	(0,06)	(0,05)	(0,14)	1,00							
7 Real interest	(0,02)	0,00	0,06	0,02	0,04	(0,09)	1,00						
8 Foreign saving	(0,45)	(0,54)	(0,32)	(0,31)	(0,03)	(0,02)	(0,01)	1,00					
9 Financial depth	0,22	0,22	0,66	(0,01)	0,02	(0,05)	0,06	(0,15)	1,00				
10 Old age dependency rate	0,11	0,15	0,73	0,02	0,04	(0,03)	0,01	(0,15)	0,41	1,00			
11 Income inequality	(0,03)	(0,08)	(0,49)	(0,03)	0,02	0,03	0,07	0,11	(0,21)	(0,63)	1,00		
12 TV sets	0,13	0,20	0,78	0,10	0,06	(0,04)	0,04	(0,21)	0,46	0,83	(0,24)	1,00	
13 Internet users	0,09	0,12	0,67	0,05	(0,08)	(0,07)	(0,03)	(0,15)	0,51	0,56	(0,12)	0,62	1,00

Table 4. Descriptive statistics, panel data, 1980-2013

Variable		Mean	Std. Dev.	Min	Max	Observations
Gross Private Saving (as % of GDP)	overall	22,27	9,27	(77,01)	64,84	N = 3011
	between			7,18	1,88	46,20 n = 139
	within			5,91	(56,61)	53,50 T-bar = 21,6619
Gross National Saving (as % of GDP)	overall	18,87	10,31	(67,25)	75,45	N = 4411
	between			7,72	(3,89)	43,27 n = 139
	within			6,86	(44,50)	72,63 T-bar = 31,7338
Real GDP per capita, PPP	overall	12.481	13.141	329	97.410	N = 4390
	between			12.237	573	67.501 n = 138
	within			4.148	(18.976)	42.705 T-bar = 31,8116
General Government Saving (as % of GDP)	overall	(2,56)	4,63	(35,40)	40,34	N = 3011
	between			2,76	(11,73)	8,18 n = 139
	within			3,70	(35,20)	38,39 T-bar = 21,6619
GDP per capita growth (annual %)	overall	1,80	5,22	(47,31)	50,03	N = 4391
	between			1,63	(2,05)	8,76 n = 139
	within			4,96	(47,48)	48,82 T-bar = 31,5899
Inflation rate (annual %)	overall	36,39	319,67	-	10000,00	N = 4027
	between			92,47	1,18	632,23 n = 139
	within			305,62	(594,20)	9675,82 T-bar = 28,9712
Real interest rate (%)	overall	(0,04)	14,23	(98,58)	445,26	N = 3545
	between			6,19	(32,15)	36,40 n = 138
	within			12,93	(90,80)	433,90 T-bar = 25,6884
Foreign saving (as % of GDP)	overall	3,72	8,46	(43,40)	65,26	N = 3967
	between			5,72	(11,34)	21,25 n = 139
	within			6,39	(39,37)	59,23 T-bar = 28,5396
Financial depth (M2 as % of GDP)	overall	55,23	52,78	0,83	669,88	N = 3946
	between			61,41	11,18	599,24 n = 139
	within			19,91	(63,71)	192,32 T = 28,3885
Old age dependency rate	overall	0,12	0,07	0,04	0,41	N = 4716
	between			0,06	0,04	0,27 n = 139
	within			0,02	0,01	0,29 T-bar = 33,9281
Income inequality (Gini index)	overall	38,05	8,84	18,30	59,50	N = 3589
	between			8,46	23,03	57,70 n = 138
	within			2,02	28,01	47,21 T = 26,0072

TV sets (per 100 people)	overall	23,92	22,34	0,01	155,76	N = 4445
	between		20,15	0,28	75,59	n = 139
	within		9,68	(24,99)	110,85	T = 31,9
Internet users (per 100 people)	overall	18,86	24,88	0,00	96,55	N = 2774
	between		15,05	0,35	57,24	n = 139
	within		19,57	(37,87)	69,76	T-bar = 19,956

The results of the econometric estimations are presented in Table 5. We run several estimations exercises. The baseline model is the one we run for the world sample along the time span 1980-2013. We use alternatively, two measures of the demonstration effect: TV sets (per 100 people) and internet users (per 100 people). The coverage of these two variables is different. The information on TV sets has very good coverage in our database, as it is a widespread telecommunication medium during this period. In the case of the internet, it is a new communication medium, and the data is available in the surveys since 1990, although only some countries have data before 1995. Therefore, we estimate the model for the period 1980-2013, and we analyze the results when we started in 1995. For more explanations on the definition of these variables and its construction, see the Appendix with the details of the sources.

For each model, we run ordinary least squares (OLS, columns 1 and 2), fixed effects (FE, columns 3 and 4) and random effects (RE, columns 5 and 6). For all cases, we use robust standard errors. We compare the levels and significance of the coefficients, and we chose the better specification following the result of the Hausman test. A rejection of the null hypothesis of a correlation between the individual effects and the regressors was interpreted as an adoption of fixed effects, and we adopt random effects when there is no rejection of the hypothesis. We include time-dummies variables for all cases.

For the dynamic model, we use the system GMM estimator, which allow us to control for unobserved country-specific effects and potential endogeneity of the regressors. In general, the results obtained with GMM system estimator are similar to those obtained with the other estimation techniques, with some exceptions that we will comment below.

Table 5. Estimation results of the panel data (1980-2013). Dependent variable: Private saving (As a percentage of GDP)

VARIABLES	OLS	OLS	FIXED EFFECTS	FIXED EFFECTS	RANDOM EFFECTS	RANDOM EFFECTS	SYSTEM GMM	SYSTEM GMM
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Real GDP per capita, PPP (log)	1.176***	1.611***	9.761***	12.25***	3.980***	4.286***	9.405**	7.368**
	[0.342]	[0.347]	[2.566]	[3.086]	[0.771]	[0.849]	[4.151]	[3.024]
General Government Saving (as % of GDP)	-0.613***	-0.637***	-0.795***	-0.796***	-0.760***	-0.766***	-0.771***	-0.759***
	[0.0575]	[0.0560]	[0.0471]	[0.0495]	[0.0473]	[0.0497]	[0.127]	[0.0964]
GDP per capita growth (annual %)	0.593***	0.557***	0.249***	0.212***	0.298***	0.270***	0.0918	0.123**

	[0.0577]	[0.0589]	[0.0424]	[0.0414]	[0.0461]	[0.0463]	[0.0701]	[0.0621]
Inflation rate (log)	-0.0135	-0.0323	-0.0112	-0.0342	-0.00670	-0.00720	-0.0663	-0.0483
	[0.0808]	[0.0813]	[0.0534]	[0.0539]	[0.0514]	[0.0509]	[0.0745]	[0.0739]
Real interest rate (%)	-0.0677**	-0.0577*	-0.00610	-0.0140	-0.00421	-0.00123	-0.0146	0.00185
	[0.0303]	[0.0307]	[0.0276]	[0.0250]	[0.0266]	[0.0268]	[0.0431]	[0.0544]
Foreign saving (as % of GDP)	-0.560***	-0.567***	-0.389***	-0.404***	-0.406***	-0.414***	-0.309***	-0.318***
	[0.0320]	[0.0301]	[0.0477]	[0.0460]	[0.0453]	[0.0424]	[0.0768]	[0.0566]
Financial depth (M2 as % of GDP)	0.0376***	0.0375***	-0.0141	0.00351	-0.000116	0.00835	-0.0556*	-0.0307
	[0.00482]	[0.00468]	[0.0118]	[0.0112]	[0.00941]	[0.00943]	[0.0329]	[0.0189]
Old age dependency rate	-13.39**	-15.40***	-18.96	-5.324	-32.68***	-26.09***	-41.84*	-56.26**
	[5.439]	[5.820]	[19.58]	[19.96]	[9.866]	[9.326]	[23.71]	[24.79]
Income inequality (Gini index)	0.0285	0.00700	0.00539	0.174	0.0230	0.0772	-0.129	-0.121
	[0.0300]	[0.0327]	[0.156]	[0.208]	[0.0862]	[0.0977]	[0.119]	[0.108]
TV sets (per 100 people)	-0.0187		0.00269		-0.0174		-0.220**	
	[0.0114]		[0.0207]		[0.0202]		[0.107]	
Internet users (per 100 people)		-0.0496***		-0.0563**		-0.0513**		-0.142**
		[0.0127]		[0.0240]		[0.0202]		[0.0666]
Gross Private Saving (as % of GDP) (t-1)							0.452***	0.505***
							[0.0919]	[0.0906]
Constant	10.03***	6.189**	-63.46**	-94.89***	-10.82	-15.46*	-57.89*	-48.21**
	[2.741]	[2.552]	[25.07]	[32.33]	[7.234]	[8.796]	[31.74]	[24.49]
Time-fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,874	1,791	1,874	1,791	1,874	1,791	1,808	1,736
R-squared	0.396	0.410	0.334	0.351				
Number of countries			133	133	133	133	133	133
Number of instruments								
F-test			27,16	25,58				
Prob			0,000	0,000				
Breusch-Pagan test								
Chi2					3077.3	2404.11		
Prob (Chi2)					0,000	0,000		
Hausman Test								
Chi2			49.35	74.03				
Prob (Chi2)			0,020	0,000				
AR(1) Test, p-value							0,000	0,000
AR(2) Test, p-value							0,363	0,559
Hansen J-test, p-value							0,438	0,198
Robust standard errors in brackets								
*** p<0.01, ** p<0.05, * p<0.1								

We summarize here the key findings and the story that could be told about Nurkse's type of international demonstration effects influencing private savings in the aggregate.

As said before, we address the research question using two alternative indicators for the demonstration effect: number of TV sets and internet users. In the case of the models with fixed effects (Columns 3 and 4) and system GMM (Columns 7 and 8) the main findings are the following.

Measured by internet users, the **demonstration effect** has a negative effect on saving (with a significant level of 5%). This result is independent of whether we use fixed effects (Column 4) or System GMM (Column 8). When we include TV sets, we find a negative and significant coefficient in the dynamic model (Column 7). However, we do not find a significant effect in the fixed effects regression (Column 3).

The coefficients of **per capita income** (in logarithms) **and income growth** are positive and significant at 1% or 5% level, for most of the cases. As outlined by Loayza et al. (2000) the positive effect of income on private saving implies that economic policies that promote growth are an indirect but effective channel to raise saving. Considering that part of the increase of saving becomes the financial support of domestic investment (following the evidence of Feldstein and Horioka, 1980), successful growth policies may result in a virtuous cycle of saving, capital accumulation, and growth). The exception is that income growth seems to lack statistical significance when we run GMM system and include the TV sets.

The financial factors measured by **the real interest rate and the financial depth (M2/GDP)** appear with no statistical significance effects on private saving in most of the cases. The only model when financial depth shows a significant negative effect is in the dynamic model (System GMM), though with a level of significance of 10%. This relatively weak result poses some doubts about the effectiveness of the financial reforms to promote saving. The proxy of macroeconomic uncertainty, **inflation rate**, appears with a negative but not significant effect on private savings.

Fiscal policy influences private saving. The government saving ratio shows a statistically significant and negative effect on private saving rate, a result in line with the literature review; i.e., there exist partial Ricardian equivalence. The result of **foreign saving** is in line with some empirical works. We find a negative and statistically significant effect on private saving.

The demographic variable included - old dependency rate- has a statistically significant negative effect in the dynamic models –with a level of significance of 5% and 10%- but not in the fixed effects regressions. This result means that there some evidence to support the life-cycle hypothesis.

Income distribution -measured with the GINI index- seems to be no significant to explain private saving.

Finally, the outcome of the system GMM models shows a persistence effect of **the past private saving** on the present rates, based on the positive and significant effect –with 1% of significance- of the lagged value of the saving rate.

We estimate the models with alternative specifications to test the robustness of our results (in the Appendix we present the tables with the outputs). First, we check the robustness of the results for a shorter period 1995-2013, for those models where we include internet, as the data for this variable is better since 1995 (See Table A3). The main results do not change; in particular, the negative impact of the demonstration effect measured by internet on private saving keeps its statistical significance –at 5%-. On top of that, income level and growth, foreign saving and fiscal policy show significant effects on private saving.

Second, another drawback the model may have is that some of the explanatory variables may be endogenous. Some authors use the lagged values of the independent variables to mitigate –but not fully resolve– the presence of endogeneity (Table A4). We use the first lags of the explanatory variables and run the fixed effect models. The exposition variables maintain their negative effect on private saving, and we find significant coefficient for internet users and for TV sets as well. As for the case of the other explanatory variables, the main difference with the model without lags is that economic growth is not significant anymore.

Third, since we are working with several macroeconomic variables that may contain cyclical movements for some periods, we run estimations with five-year moving averages of the variables, and we run the fixed effects estimators (Table A5). Regarding the exposition effect, TV does not appear to be significant, but the internet maintains its negative effect on private savings. The results about the coefficients of the rest of the variables are the same as the models based on annual observations.

To sum up, the main control variables have the correct signs and significance levels. We find that the demonstration effect (captured by the TV sets and internet) have the expected sign.

5. Conclusions

Throughout the world, it has been proved that it is hard to find stable regional patterns of private savings. These stylized facts remain intellectual puzzles and development policy challenges. In addition, despite the difficulties discerning causes and effects, it has been shown that in the long run, it is not possible to grow sustainably with domestic savings persistently below investments. For these and other scientific considerations, understanding the determinants of savings is an important research objective that has previously raised challenges to analysts that tried to make sense of results from varied, distinct models.

This paper aims to bring together two strands of the literature. On the one hand, several empirical studies have explored the determinants of saving rates across countries, but they are far from conclusive. On the other hand, a growing literature is working with the hypothesis of emulation patterns between consumers and their reference group, getting rid of the neoclassical assumption of independent preferences to explain consumption and saving. The main purpose was to study the behavioral patterns of saving to understand the performance of private savings. We bring empirical evidence to discuss the emulation patterns between consumers as a driver of private savings, using a macro approach based on cross-country analysis.

We use panel data techniques to explain the effect of the emulation patterns on private saving rate based on data for 169 countries from all over the world for the period 1980-2013. We estimate several models (fixed, random, and dynamic models), so we can compare the results and arrive at robust conclusions. We used two measures of the exposition effect: TV sets and internet users. After controlling for the standard regressors, we found that the international demonstration effect measured by the internet users has a negative effect on private saving and statistically significant. In addition, these results are robust after estimating different models. When using TV sets, we find a negative effect and significant in the dynamic model but not in the fixed effects.

The discussion on the mechanisms that may account for a demonstration effect, and the empirical evidence we find, provide useful insights in order to understand the differences in private savings across the world. Synthesizing and emphasizing the substantive results, the empirical analysis shows that the global pattern of private savings maintains a strong influence of income level and income growth; the other saving components (government and foreign savings); and old-age dependency ratios. Controlling for all these, we find evidence that the greater the exposure to global trends via some global media, the smaller the savings rates and the likelier the hypothesis of demonstration effects as a candidate explanation.

6. References

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Appendix

A.1 Sources and description of the data

Deposit interest rate –

Deposit interest rate is the rate paid by commercial or similar banks for demand, time, or savings deposits. The terms and conditions attached to these rates differ by country. As for OECD countries, except the United States, the deposit rate was taken from the World Bank and interpolated with short-term interest rate data from OECD. This was done in the cases of Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Greece, Iceland, Indonesia, Italy, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Sweden and the United Kingdom.

Source: World Development Indicators, World Bank. August 2014. Organization for Economic Co-operation and Development. December 2014. As for the United States, data were collected from Federal Reserve Bank of St. Louis regarding 3-month yields of Certificates of Deposit.

Financial depth –

Measured as M2 as a percentage of GDP. M2 accounts for money and quasi-money, which comprises the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government

Source: World Development Indicators, World Bank. August 2014.

Foreign saving –

Measured as the opposite of Current Account Balance as a percentage of GDP. The current account balance is the sum of net exports of goods and services, net primary income, and net secondary income. A current account surplus increases a country's net foreign assets by the corresponding amount, and a current account deficit does the reverse. One outlier was dropped off the sample, where the foreign saving was below -50% (Lesotho in 1991).

Source: World Development Indicators, World Bank. August 2014. Complemented with data from WDI 2008 for years not covered in WDI 2014.

GDP per capita (PPP) –

Gross domestic product converted to international dollars using purchasing power parity rates. Data are in constant 2011 international dollars

Source: World Development Indicators, World Bank. August 2014.

GDP per capita growth –

Annual percentage growth rate of GDP per capita based on constant local currency.

Source: World Development Indicators, World Bank. August 2014. For Argentina: Ferreres, O. (2006). *Dos siglos de economía argentina*. Fundación Norte y Sur; Instituto Nacional de Estadísticas y Censos (<https://www.indec.gob.ar/>) and the Conference Board.

General Government net lending/borrowing –

Net lending/borrowing is calculated as revenue minus total expenditure. It measures the extent to which general government is either putting financial resources at the disposal of other sectors in the economy and nonresidents (net lending), or utilizing the financial resources generated by other sectors and nonresidents (net borrowing). Net lending/borrowing is also equal to net acquisition of financial assets minus net incurrence of liabilities.

Source: World Economic Outlook Database April 2014, International Monetary Fund

Gross National Savings –

Gross disposable income less final consumption expenditure after taking account of an adjustment for pension funds. For many countries, the estimates of national saving are built up from national accounts data on gross domestic investment and from the balance of payments-based data on net foreign investment. Expressed as a ratio of Gross National Savings in current local currency and GDP in current local currency.

Source: World Economic Outlook Database April 2014, International Monetary Fund

Income Inequality –

Estimate of Gini index of disposable-income inequality (post-tax, post-transfer), using the Standardized World Income Inequality Database which is a revision of the WIID and the Luxembourg Income Study, published by Frederick Solt.

Source: Solt, Frederick (2016) "The Standardized World Income Inequality Database." *Social Science Quarterly* 97(5):1267-1281. SWIID Version 6.1, October 2017. (2017-10-27).

Inflation –

Measured as the annual percentage change of the consumer price index. The inflation rate truncated for values below 0%. All the negative values for annual inflation are considered as a 0.01% inflation. For very high inflation rates ("hyperinflation episodes"), that is, over 10.000% we set the values on 10.000%. These episodes were the case of Republic of Congo in 1994 and Bolivia in 1985.

Source: World Development Indicators, World Bank. August 2014. For Argentina: from 2006 onwards data from Graciela Bevacqua, Provincia de San Luis, and IPC Congreso (from Base de Datos de Rodolfo G. Frank). For Chile: Instituto Nacional de Estadística (INE) from Chile.

Internet users per 100 people.

Internet users are individuals who have used the Internet (from any location) in the last 12 months. The Internet can be used via a computer, mobile phone, personal digital assistant, games machine, digital TV, etc.

Information is complete from 2000 onwards. For previous years, data was completed through interpolation when missing. Furthermore, missing data in each country was completed according to the following criteria. Years before the year with the first annual data were left in blank. On years after the last annual data from the source we kept unchanged the last known data, this was the done across the board since 2010 and in many countries since the 2000s. On years without data from years with, we interpolated according to the evolution between known data. Countries, where the latter procedure was done, were Australia, Azerbaijan, Belarus, Belize, Granada, Guyana, Haiti, Mongolia, Pakistan, Rwanda, Seychelles, and Sierra Leone.

Source: International Telecommunication Union International Telecommunication Union until 2011 and World Development Indicators from 2012 onwards, World Bank. August 2014.

Old-age dependency rate -

Measured as the ratio between the population ages 65 and above and the population between the ages of 15 and 64. It is used to approximate the average number of old people needing care per working-age population.

Source: Constructed based in data of population from World Development Indicators, World Bank. August 2014.

Private saving (% GDP)-

Private saving is the result of gross national saving (as % of GDP) minus general government saving (as % of GDP). Two outliers were dropped off the sample, where the private saving rate was below -50%, which were the cases of Georgia 2000 and 2001.

Source: See Gross national saving (%GDP) and General government saving (%GDP)

Real deposit interest rate –

Deposit interest rate expressed in real terms. The rate was deflated using the inflation rate.

Source: Constructed based in data from World Development Indicators, World Bank. August 2014.

TV sets per 100 people–

The total quantity of television sets per 100 people. Constructed from TV sets data from the International Telecommunication Union and population information from World Development

Indicators. Values of zero have been replaced as missing. The original data is the number of television sets provided by ITU, and we calculated the quantity per 100 inhabitants using the figures of the population from WDI. The number of TV sets only goes until 2008, as it was no longer included in the surveys. Missing data on the total quantity of television sets was completed based on the evolution of the proportion of households with television. Furthermore, missing data in each country was completed according to the following criteria. Years before the year with the first annual data were left in blank. On years after the last annual data from the source we kept unchanged the last known data, this was the done across the board since 2010 and in many countries since the 2000s. For years without data between years, we interpolated according to the evolution between known data. Countries where the latter procedure was done: Albania, Cambodia, Korea, United Kingdom, Iceland, Macedonia, Rumania, Swaziland, Ukraine, and Vietnam.

Source: We used TV sets data from the International Telecommunication Union and population information from World Development Indicators, World Bank. August 2014.

A.2 List of countries included

East Asia & Pacific	Europe & Central Asia	Sub-Saharan Africa
Australia	Poland	Botswana
China	Portugal	Côte d'Ivoire
Hong Kong	Romania	Cameroon
Indonesia	Russia	Congo
Japon	Serbia	Cabo Verde
Cambodia	Slovakia	Ethiopia
Korea	Slovenia	Gabon
Mongolia	Sweden	Ghana
Malasya	Tajikistan	Guinea
New Zealand	Turkey	Gambia
Phillipines	Ukraine	Guinea-Bissau
Papua New Guinea	Latin America & Caribbean	Kenya
Singapour	Argentina	Lesotho
Thailand	Bahamas	Madagascar
Vietnam	Belize	Mali
Europe & Central Asia	Bolivia	Mozambique
Albania	Brazil	Mauritius
Armenia	Barbados	Malawi
Austria	Chile	Namibia
Azerbaijan	Colombia	Niger
Belgium	Costa Rica	Nigeria
Bulgaria	Dominican Republic	Rwanda
Bosnia and Herzegovina	Ecuador	Senegal
Belarus	Grenada	Sierra Leone
Cyprus	Guatemala	Sao Tome and Principe
Czech Republic	Guyanas	Eswatini
Germany	Honduras	Seychelles
Denmark	Haiti	Togo

Spain	Jamaica	Tanzania
Estonia	Saint Lucia	Uganda
Finland	Mexico	South Africa
France	Nicaragua	Zambia
Great Britain	Panama	Middle East & North Africa
Georgia	Peru	Algeria
Greece	Puerto Rico	Djibouti
Croatia	El Salvador	Egypt
Hungary	Trinidad and Tobago	Iraq
Ireland	Uruguay	Israel
Island	Saint Vincent and the Grenadines	Jordania
Italy	Venezuela	Lebanon
Kyrgyzstan	North America	Malta
Lituania	Canada	Tunisia
Luxemburg	United States	Yemen
Latvia	Sub-Saharan Africa	South Asia
Moldova	Angola	Banclgadesh
Yugoslavia	Burundi	Bhutan
Netherlands	Benin	India
Norway	Burkin Faso	Sri Lanka
		Maldives
		Nepal
		Pakistan

Table A3. Panel data estimations 1995-2013 (Dependent variable: Private saving as % GDP)

VARIABLES	FIXED EFFECTS	RANDOM EFFECTS	SYSTEM GMM
	(1)	(2)	(3)
Real GDP per capita, PPP (log)	12.92*** [3.181]	4.144*** [0.866]	7.552** [3.268]
General Government Saving (as % of GDP)	-0.830*** [0.0502]	-0.792*** [0.0514]	-0.812*** [0.105]
GDP per capita growth (annual %)	0.206*** [0.0426]	0.269*** [0.0476]	0.108 [0.0715]
Inflation rate (log)	-0.0472 [0.0535]	-0.0160 [0.0500]	-0.0524 [0.0796]
Real interest rate (%)	-0.0179 [0.0249]	-0.00268 [0.0268]	-0.00934 [0.0601]
Foreign saving (as % of GDP)	-0.407*** [0.0467]	-0.417*** [0.0430]	-0.327*** [0.0624]
Financial depth (M2 as % of GDP)	0.00761 [0.0119]	0.00972 [0.00970]	-0.0342* [0.0196]
Old age dependency rate	10.36 [24.27]	-21.43** [10.62]	-60.31** [27.02]
Income inequality (Gini index)	0.159 [0.215]	0.0783 [0.0995]	-0.178 [0.121]
TV sets (per 100 people)			
Internet users (per 100 people)	-0.0689** [0.0268]	-0.0590*** [0.0215]	-0.147** [0.0721]
Gross Private Saving (as % of GDP) (t-1)			0.502*** [0.0990]
Constant	-102.9*** [34.62]	-14.65* [8.604]	-42.14* [23.82]
Time-fixed effects	YES	YES	YES
Observations	1,717	1,717	
R-squared	0.347		
Number of countries	133	133	133
Number of instruments			
F-test	29,13		
Prob	0,000		
Breusch-Pagan test			
Chi2		2343,28	
Prob (Chi2)		0,000	
Hausman Test			
Chi2	99,88		
Prob (Chi2)	0,000		
AR(1) Test, p-value			0
AR(2) Test, p-value			0,477
Hansen J-test, p-value			0,053
Robust standard errors in brackets			
*** p<0.01, ** p<0.05, * p<0.1			

Table A4. Panel data estimation with lags of the explanatory values, 1980-2013.
Dependent variable: Private saving rate (as % of GDP)

	FIXED EFFECTS	FIXED EFFECTS
	(1)	(2)
Real GDP per capita, PPP (log) (t-1)	5.847*** [1.983]	7.285*** [2.393]
General Government Saving (as % of GDP) (t-1)	-0.139** [0.0587]	-0.140** [0.0572]
GDP per capita growth (annual %) (t-1)	0.0998 [0.0617]	0.0689 [0.0631]
Inflation rate (log) (t-1)	-0.0142 [0.0711]	-0.0247 [0.0692]
Real interest rate (%) (t-1)	0.0660 [0.0423]	0.0634 [0.0441]
Foreign saving (as % of GDP) (t-1)	-0.243*** [0.0399]	-0.256*** [0.0403]
Financial depth (M2 as % of GDP) (t-1)	-0.0123 [0.0133]	0.00484 [0.0134]
Old age dependency rate (t-1)	-23.94 [17.25]	-3.817 [16.91]
Income inequality (Gini index) (t-1)	0.185 [0.161]	0.263 [0.194]
TV sets (per 100 people) (t-1)	-0.0422** [0.0187]	
Internet users (per 100 people) (t-1)		-0.0535** [0.0210]
Constant	-34.00* [18.45]	-52.52** [24.01]
Time-fixed effects	YES	YES
Observations	1,874	1,791
R-squared	0.113	0.116
Number of countries	133	133
Number of instruments		
F-test	6,59	6,22
Prob	0,000	0,000
Hausman Test		
Chi2	64,86	117,56
Prob (Chi2)	0,000	0,000
Robust standard errors in brackets		

*** p<0.01, ** p<0.05, * p<0.1

Table A5. Panel data estimation: five-year averages, 1980-2013. Dependent variable: private saving rate (as % of GDP).

	FIXED EFFECTS	
	(1)	(2)
Real GDP per capita, PPP (log)	9.030*** [2.491]	10.86*** [2.779]
General Government Saving (as % of GDP)	-0.598*** [0.0762]	-0.596*** [0.0787]
GDP per capita growth (annual %)	0.408*** [0.112]	0.313*** [0.115]
Inflation rate (log)	0.124 [0.283]	0.00119 [0.276]
Real interest rate (%)	0.0428 [0.0586]	0.0175 [0.0558]
Foreign saving (as % of GDP)	-0.347*** [0.0709]	-0.389*** [0.0568]
Financial depth (M2 as % of GDP)	-0.0117 [0.0144]	0.00608 [0.0132]
Old age dependency rate	-13.06 [16.34]	-1.453 [15.67]
Income inequality (Gini index)	0.107 [0.109]	0.198* [0.110]
TV sets (per 100 people)	-0.00144 [0.0227]	
Internet users (per 100 people)		-0.0432* [0.0224]
Constant	-62.49*** [23.18]	-84.65*** [27.74]
Time-fixed effects	YES	YES
Observations	1,948	1,850
R-squared	0.271	0.290
Number of countries	133	133
Number of instruments		
F-test	10,96	9,4
Prob	0,000	0,000
Hausman Test		
Chi2	195.37	164.44
Prob (Chi2)	0,000	0,000
Robust standard errors in brackets		
*** p<0.01, ** p<0.05, * p<0.1		

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