

Towards a System Dynamics Model of De Soto's Theory on Informal Economy

Camilo Olaya

University of Los Andes
School of Engineering
Email: colaya@uniandes.edu.co

Fabio Díaz

University of Los Andes
School of Engineering
Email: fa-diaz@uniandes.edu.co

Santiago Caicedo

University of Los Andes
School of Engineering
Email: san-caic@uniandes.edu.co

Abstract

This paper presents the first phase of a work in progress which aims at building a System Dynamics simulation model of the theory of the Peruvian economist Hernando De Soto. This theory proposes that the explanation for the fail of capitalism in Latin America should be looked in the informal sector of the region. The complete project will develop a full model for testing and complementing such a claim. This first phase presented here builds the platform for this endeavor; it briefly introduces the theory of De Soto and underlines its relevance and suitability for a System Dynamics approach; the article also connects the claims of the theory with the modeling language of System Dynamics, presenting the main structures of the simulation model and a further link with path dependence patterns. Finally, from this discussion, the article delineates the next steps to be taken.

I. Introduction

System Dynamics has been recognized as a powerful means to represent theories (Sterman 2000). The value rests not only in the capability of representing interconnected complex structures and simulating behaviors associated with them but also in its strength to communicate counterintuitive and novel ideas. This article introduces the first phase of a novel project that aims to build a simulation model of the original theory of the Peruvian economist Hernando de Soto (2000). This theory seeks to explain why capitalism has succeeded in particular Western countries while at the same time it has failed in broad regions of the world, primarily in the former communist countries, Africa and Latin America. De Soto presents a very simple and at the same time counterintuitive idea in order to explain why broad regions of the world haven't been able to benefit from capitalism. In short, the core of the theory suggests that the main reason is the inability of such regions to produce capital — in spite of being wealthy regions — because of the lack of representational processes that would make assets visible and productive. According to de Soto (2000) this explains the underdevelopment of many Third World countries and former communist nations.

The article is organized in four sections as follows. After this short introduction the second section presents an introduction to the theory of De Soto; it shows the basis for conceptualizing it using System Dynamics; in particular the section emphasizes the information gap between informal and formal economies, and how it can lead to wrong macroeconomic decisions. The third section introduces a first macro-model for the theory; major stocks and main sectors are identified, following the theses of De Soto; the discussion is also complemented with a further hypothesis: the path dependence character of the involved systems. The last section suggests the next steps to take; it also introduces the implications and potential for testing and spreading de Soto's theory using System Dynamics.

II. Informal Economy and the Theory of De Soto

The striking situation addressed by the Peruvian economist can be illustrated with the following quotation:

Imagine a country where nobody can identify who owns what, addresses cannot be easily verified, people cannot be made to pay their debts, resources cannot conveniently be turned into money, ownership cannot be divided into shares, descriptions of assets are not standardized and cannot be easily compared, and the rules that govern property vary from neighborhood to neighborhood or even from street to street. You have just put yourself into the life of a developing country...more precisely, you imagined life for 80% of its population. (De Soto 2000, p. 15).

In fact the previous quotation is a faithful description of a general situation that characterizes Latin America. Yet, even more surprising is that such 80 percent of the population is not badly impoverished; indeed they possess far more than someone might conceive. The astonishing difficulty is that their assets are not represented in such a way that can produce additional value; the related economic transactions on property rights are just not legally enforceable; the machine of value production cannot be started.

The concept of *informal economy* is strongly related to specific legal and social backgrounds. Basically it refers to unregulated economic activities in an environment in which similar activities are regulated. People involved in an informal economic activity feel often comfortable with not being controlled by a government even knowing they will not have legal guarantees and protection. Enrique Ghersi (1997), coauthor with Hernando de Soto of *The Other Path*, affirms that informal activities are necessarily illegal – but not criminal – because they are generating income without taxing. Ghersi's main premise is that, “contrary to conventional wisdom, popular capitalism exists in Latin America, and is created by the activities generally categorized as informal.” (Ghersi 1997, p. 1) Strong difficulties emerge from this fact because government decisions are always taken based on incomplete information. For instance, informal economic activities are not included in a country's Gross National Product: “the key to development lies not in the pursuit of any classic economic variable, such as the expansion of savings, the influx of foreign capital, entrepreneurial know-how, or the introduction of technology” (Manders, 2004, p. 178). In fact, in order to understand development there is a subtle factor that seems to remain unnoticed by the wealthy

West and by many governments: “The cities of the Third World (...) are teeming with entrepreneurs. You cannot walk through a Middle Eastern market [or] hike up to a Latin American village (...) without someone trying to make a deal with you. The inhabitants of these countries possess (...) an astonishing ability to wring a profit out of practically nothing.” (De Soto 2000, pp. 15-18)

The inevitable result of this entrepreneurship and saved money is, of course, profit and new assets. Since informal economy leads to a strong preference for utilizing cash, there are no efficient ways to track participants. Therefore, influence of informal activities on economy can only be measured by indirect ways and with a long information delay. A country with any proportion of informal economy will never have reliable macroeconomic figures. In addition, informal activities are often linked to folklore issues. In certain Latin-American countries, people use to applaud contraband, mostly because of the enormous difference of prices between *black* and legal markets. Low prices are often a competitive advantage for informal sellers and, as a result, they will try to keep it as long as possible. In Latin-America, where laws (and their enforcement) are not strong enough, perception of illegality tends to become soft within people. Moreover, illegal immigration is also linked to informal activities; immigrants tend to organize in networks of informal economy, in which they offer goods and services (mostly services) without declaring income.

The Thesis

The main claim of the theory can be summarized with this statement: “the major stumbling block that keeps the rest of the world from benefit from capitalism is its inability to produce capital” (De Soto 2000 p. 5). The target regions of such a claim are Asia, Africa, Middle East, and Latin America, where most of poverty in the world prevails. However, De Soto emphasizes that, somehow paradoxically, most of the poor already possess the necessary assets to produce capital; and the poor also save. For instance, according to his research results, the value of savings among the poor equals 45 times all the foreign aid received throughout the world from 1945 to 2000. A typical example is the poorest Latin America’s nation — Haiti — where the total assets of the poor are more that 150 times greater than all the foreign investment Haiti has received since its independence in 1804.

Nevertheless, these resources are held in defective forms: there is no information, no formal property rights, no adequate documentation, no formal representation, and thus, these assets cannot be turned into capital, they cannot be traded outside informal, narrow circles and they cannot be used to propel further capital production. Without their proper representation such assets are just “dead” and unable to create capital. Moreover, De Soto (2000) underlines that only the West has the conversion process that transforms assets and labor into capital. Furthermore, he adds that Westerners have taken this mechanism so much for granted that they have lost all awareness of its existence; and worse, there is no blue-print or formal manual to follow.

The two main interconnected pillars of the theory are introduced next. On the one hand the problem of the lack of information. On the other hand, the core of the theory which is labeled by De Soto as “the mystery of capital”.

(i) Missing Information

The first main point of the theory is the phenomenon of missing information. Contrary to common Western thinking, in the underdeveloped regions of the world this lack of formal information creates the very impossibility of getting into the formal sector. This situation is best illustrated with the results found by the research team of De Soto (2000). For example, it can take 289 days to open a business in Lima (spending 6 hours per day); the cost of legal registration is 31 times the monthly minimum wage; it can take 7 years to build a house on state-owned land, involving 297 administrative steps in 52 government offices. ¿And what about obtaining a legal title for that piece of land? 728 administrative steps are needed. But this is not the exception; this is the rule in the target regions. For instance, building a house on state-owned land in Philippines requires 168 steps, involving 53 public and private agencies, and it takes 13 to 25 years. A similar situation for the same case can be identified in Egypt: at least 77 steps, through 31 agencies; and it takes 5-14 years. The conclusion is straightforward: in these countries, it is as much as complicated to *stay* legal as it is to *become* legal. “Inevitably, migrants do not so much break the law as the law breaks them” (De Soto 2000, p. 21).

This state of affairs almost forces people to stay in the undercapitalized parallel sector of informal economy. Furthermore, what must be noticed is that indeed it is legality that is marginal; extralegality is the norm. The poor have already taken control of vast quantities of real estate and production. For example, again according to De Soto's findings, in Philippines 57% of city dwellers and 67% of people in the countryside live in housing that is "dead" capital. In Peru: 53% of city dwellers and 81% of people in the countryside live in extralegal dwellings. In Haiti: 68% and 97% respectively. In Egypt: 92% and 83%. And so on. The dilemma is placed in the fact that these resources are commercially and financially invisible. "Nobody really knows who owns what or where, who is accountable for the performance of obligations, who is responsible for losses and fraud, or what mechanisms are available to enforce payment for services and goods delivered. Consequently, most potential assets in these countries have not been identified or realized" (p. 32).

(ii) *The Mystery of Capital*

The second point — the corner stone of the theory — is related to what De Soto calls the "mystery" of Capital. He stresses that the essential meaning of capital has been lost to history. In fact, capital seems to be these days confused with money which is just one of its many forms. De Soto's theory (2000) rests on the idea that capital is not the accumulated stock of assets but the *potential* it holds to deploy new production. Such a potential must be processed and fixed into a tangible form before we can release it. How can this be done? The theory holds that what creates capital in the West is an implicit process buried in the intricacies of its formal property system, a process that has become particularly hard to distinguish.

Certainly the existences of assets and the transactions that transform them are confirmed and verified in the context of a formal property system. This is the first condition for raising the productivity of such assets. In the West this formal property system describes and organizes the economically and socially useful aspects about those assets; it preserves and records the information, usually embodying it in a title. Specific legal rules governs this process. In this way, property records and titles represent our shared concept of what is economically meaningful about any asset.

Hence, in this way we can control them since this information is required to conceptualize the related potential value. Capital is born in this process.

The theory identifies diverse advantages of having such a formal property system. The marginalization of the poor is largely explained by the inability to benefit from various effects of the property system. These benefits are summarized below.

Fixing the economic potential of assets

The transition from the invisible to the visible involves the transformation of the physical object into a man-made universe where we *represent* the resource in order to concentrate on its potential and not in the object as such. Particularly this representation formalizes the economically and socially useful qualities *about* the asset which are shared by society. As De Soto (2000) summarizes, this formal representation functions as the means to secure the interests of other parties and to create accountability by providing all the information, references, rules, and enforcement mechanisms required to do so, e.g. formal property can be easily used as collateral for a loan, or as equity exchanged for investment, or as an address for collecting debts, rates, etc.

The integration of dispersed information into one system

The property system is simply one integrated knowledge base. With this information system people can quite easily have descriptions of the economic and social qualities of any available asset. The benefit is straightforward: the potential of any asset is easier to evaluate and exchange which simply means the very possibility of boosting the production of capital.

Making people accountable

The mentioned integration of all property systems under one formal property law shifts the legitimacy of the rights of owners from the politicized context of local communities to the impersonal context of law. Hence, people with property interests are accountable individuals. For instance De Soto reminds that in the West people who do not pay for goods or services they have consumed can be identified, charged interest penalties, fined, embargoed, and have their credit ratings downgraded.

Making assets fungible

Unlike their physical counter-part, representations can be straightforwardly compared, discriminated, divided, combined, measured, mobilized, aggregated, and consequently used to furnish further deals. That is to say, assets can be easily transacted.

Networking people

The formal links among assets, owners, addresses, prices, etc. allows to have a network of individually identifiable and accountable agents. This web spreads over the private and the public sectors tying the whole society around economic transactions. De Soto underscores that such a network provides the necessary structure for the market to take place.

Protecting transactions

The formal property representation system continually tracks and protects the recorded information. Public record-keeping systems along with further private organizations register economic transactions and the evolution of the information about the traded assets. Security leads to trust among participants so that further production of capital can take place.

In short, the theory states that *the integrated formal property system (i) represents the economic qualities of assets allowing transactions and boosting the production of capital and, (ii) secures such a process.* With this background we introduce the first steps for modeling the claims of De Soto; this is presented in the next section.

III. A First Macro-Model

There are several reasons for modeling the theory of De Soto with System Dynamics. It should suffice to remind that the purpose of the analytical mathematical research branch in operations management is “to develop sophisticated relationships between narrowly defined concepts through developing new mathematical relationships to study how the models behave under different conditions... to develop logically internally consistent theories” (Wacker 1998, pp. 373-374). Such a mathematical model is more

precise, although more restrictive. The translation of verbal theory to a mathematical representation results in the loss of richness (Repenning 2002). However, there are various benefits: computer simulation is seen as a technique that is able to represent, communicate and test theoretical concepts (Liebrand 1998) and, furthermore, enhances learning capabilities in complex settings (Sterman 2000). With these motivations we proceed now to introduce our proposal.

The model presented here focuses on the two main ideas of the theory. On the one hand it presents the problem of missing information and the obstacles to become legal - for instance acquiring legal housing, entering into formal business relationships or finding a legal job. As it was shown, there are important delays associated with these processes. Moreover, given such panorama, most of the assets never become legal, thus existing only in a parallel, informal economic system. On the other hand, the second core idea is the concept of capital itself and the process of how to produce active capital. In brief, de Soto (2000) emphasizes that it is the formal property system that “provides the process, the forms and the rules that fix assets in a condition that allows us to realize them as active capital” (p. 44). This is possible because with legal property rights the assets can be widely transferred and exchanged in the market place; furthermore, this institution should warrant accountable holders. Here lies the key for having active and productive capital. The main source from which this model is constructed is de Soto’s book “The Mystery of Capital” (de Soto, 2000). We chose this work as our basis, since there the theory is fully explained and developed. However, we have complemented the discussion with previous works of de Soto (1989), with additional aspects discussed on informal economy literature, and with additional authors that develop important critique to the theory.

In this first phase of the project there are two main results to underline:

1. The discussion, connection, and development of a first macro-representation of the theory of De Soto with System Dynamics. This result shows the mentioned factors which inhibit the capacity to produce capital: missing information and the flaws of the property system.
2. The introduction of a complementary hypothesis for the theory: the role of positive feedback in informal economies. Since the actual state of the system is

unknown (missing information), capital does not get into the formal economy and the state of missing information is trapped in a reinforcing cycle since decisions taken by governments seeking to solve the problem rely on such information. The suggestive consequence is that such a view of the informal sector and its consequent pattern can be identified with path dependence behavior which can lead to a locked-in inferior equilibrium (Serman 2000).

The model brings together the problem of the lack of formal representation of potential assets with the existence of a parallel, informal extralegal economic system. Actual assets and the formal information about them are distinguished. The model shows this distinction which is one of its main highlights: on the one hand the real assets and on the other hand the minimal part of them that is really visible and formally productive. The description of the macro-model follows.

Model Definition

Given this characteristics, the model has been mapped using the software iThink 8.1. It is divided in four major sectors (see Figures 1-4). The first sector deals with population, land ownership and workforce in the market, including the information perceived by the government about these variables. The second one concentrates on the current and potential capital formation in the economies. The third sector refers to the existing and potential savings in the economy. The last one focuses on the risk.

This model is based on the one proposed by Saeed (1998), but it introduces new necessary elements, in order to assess De Soto's theory. One of the the most important components introduced in this proposal is the effect that information delays might have in the behavior of the system. This refers not only to the problem of missing information due to a lack of formal property systems but also to the underestimation of informal activities by governments (Saeed 1998, Saeed & Prankprakma 1997, Rossini, R.G., & Thomas, J.J. 1990). This idea is clearly motivated by the concept of allocation of resources in a dual system that consists of two sectors (Saeed, 1998, p115), and two possible engines for capital creation in the economies: work and real state. We also introduce the value of the perceived capital in the economy as an element that might be important as the savings in the economy, given the speculative nature of the markets.

It is also important that the model could be capable of representing the beneficial effects demarcated by De Soto (2000):

- Fixing the economic potential of assets.
- The integration of dispersed information into one system
- Making people accountable
- Making assets fungible
- Networking people
- Protecting transactions

Population, land ownership and the workforce in the market

As De Soto (2000) mentions, property rights provide the boost for a sustainable economic growth in countries. This is because the economy that generates accountability on transactions expands the portfolio of feasible business transactions, allowing a greater capital creation. But in this case, capital creation and property rights cannot be separated from the behavior of the population. This is a natural result, given that if population increases, workforce might also increase, as well as the land owned by formal and informal workers.

The model also discriminates formal and informal sectors, because the economic structure of developing countries is characterized by the existence of two *sub-economies* with different behaviors and relations (Saeed & Prankprakma, 1997, p 159).

Another important element of the model is the possibility to allow that people in the informal sector might change their works and hence they can turn into waged workers, i.e. the possibility of becoming legal. And also it works the other way around, thus the model includes the flow in the opposite direction, i.e. the move from the formal to the informal sector.

A significant difference in comparison with Saeed's (1998) work is the role that the government might play in the capital generation. Depending on perceived values of the weight of the informal sector in the economy, the government's concern for taking action may vary; for instance, through the increment of tax revenues, as seen on several Asian countries like Bangladesh, Malaysia and Sri Lanka (see Table 1).

COUNTRY	SELF EMPLOYED WORKERS (%)	WAGE WORKERS (%)
Bangladesh	56,7	43,3
Korea	42,6	57,4
Malasya	37,3	62,7
Pakistan	73,4	26,6
Philipines	54,2	45,8
Sri Lanka	42,3	57,7

Table 1.
Distribution of workers between formal and self employed sectors in some Asian countries. Source: Saeed & Prankprakma, 1997, p 159

In the case of these countries, the government could invest (through financial stimuli) in formal hiring of workers, waiting for a subsequent rising in the number of workers in the formal sector. Nevertheless, it is strongly necessary to measure and model this specific dimension of the system.

Additionally, it is necessary to consider how to properly model information delays associated with the perceived values (Sterman, 2000). In this specific context, it seems that governments tend to adjust this value just to some limited extent.

Capital formation in the economies

As De Soto points out (2000), capital formation could be explained by the number of people working in both sectors and the formal and informal land ownership. This particular adaptation of Saeed's model seeks to represent the total capital that would be generated if the amount on informal economy could be legalized, as well as the actual marginal capital generated by every subgroup. This definition allows a comparison between actual and desirable states of the system.

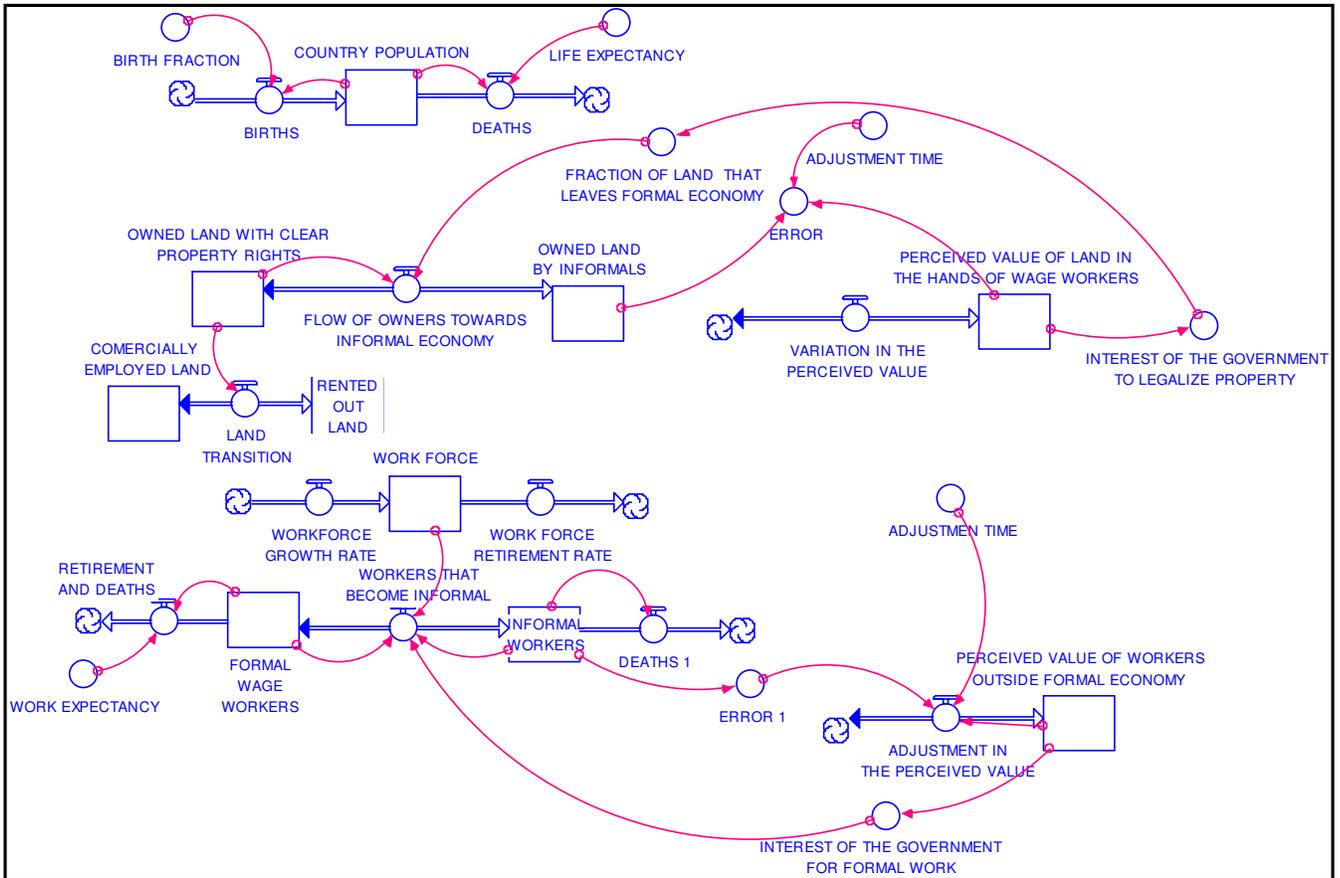


Figure 1
Stocks and flows model of the Workforce and Land property sector of the model

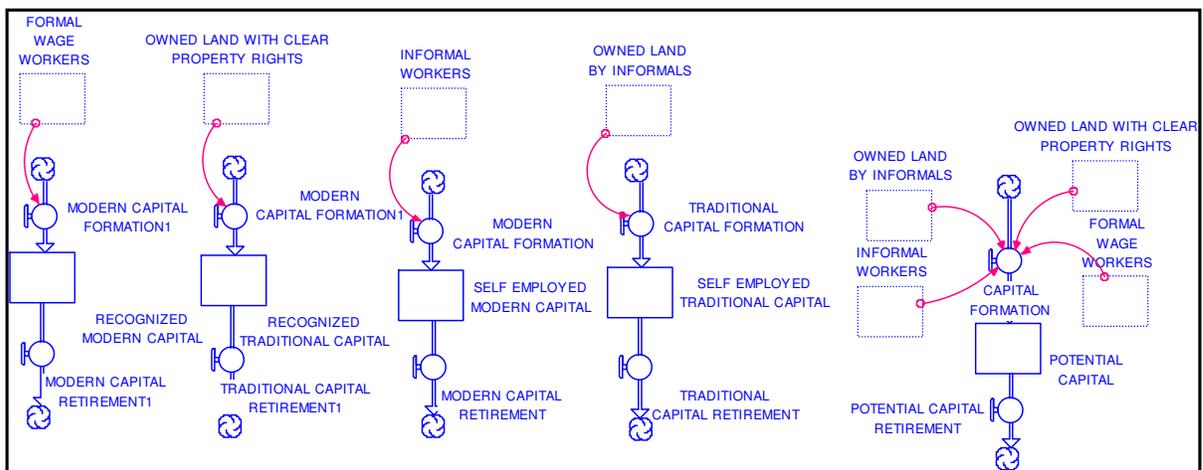


Figure 2
Stocks and flows model of the Capital formation

Savings and the potential savings in the economy

Finally, the model includes the savings in the economic system and their impact on the economic growth of the countries. In this case, the model only deals with the whole savings, as a proxy for the possible economic growth, which should also depend on capital formation. Even though this model – as the original proposal of Saeed (1998) – does not represent the influence of banks on savings and on financial sector, it should be adequate in order to characterize De Soto’s theory.

Another new feature introduced in this model is the importance of the potential value of savings because this difference between real and perceived value influences further decisions by the government to increase legal real state and formal work. Even though it is not explicitly considered in the model, it is important to pay attention to the perceived value of savings in the economy that could affect foreign and domestic investment or accelerate capital construction and real state legalization. This is because investors always define their decisions based on information that is presented in the form of indicators, which will be – after all – delayed information.

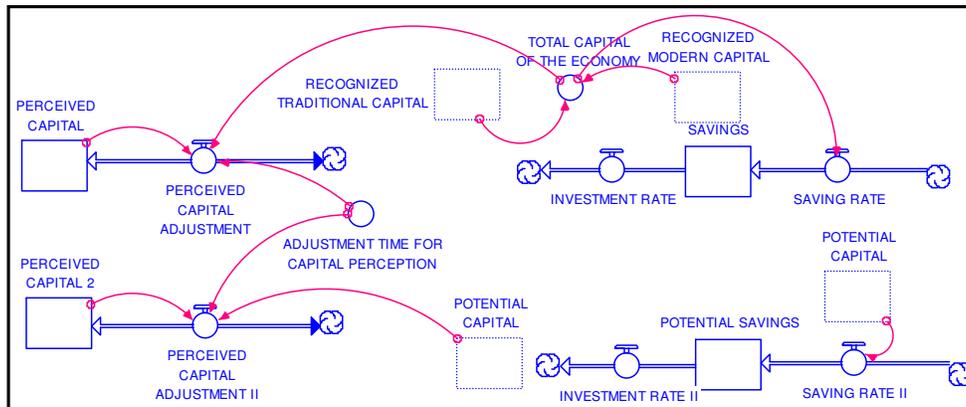


Figure 3
Stocks and Flows model of savings

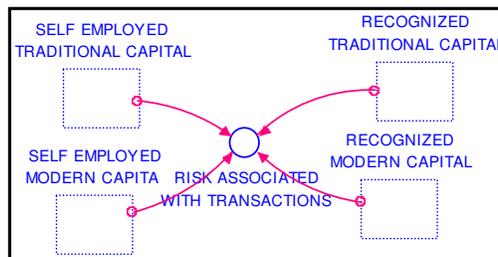


Figure 4
Effects on risk

A further element: Path dependence.

As Sterman (2000) mentions: “path dependence arises in systems whose dynamics are dominated by positive feedback processes” (p. 349). In this kind of systems there is a final state of the system that depends on the initial conditions and on random effects thorough the system evolution. Even when perturbations are small, the effect of these slight changes is magnified by the structure of the system (the reinforcing loops), this process continues until the point where changes in the trends of the model are almost impossible. One classic example is the case of the use of VCR`s and the video recording technology associated with them. Initially there was a market coped with Betamax cassettes, but around the 70`s, the VHS format entered the market. In this case the initial conditions on the early stages determined the final behavior of the system, because an initial installed base of the product generated a need in the market to offer products related to that type of VCR cassette format (Sterman 2000). Finally the VHS format won the competition because of its initial slight advantage which – as a consequence of the reinforcing loops - ended reaching the lock in state with the dominance over the market.

In the case of the model adapted from Saeed, we can appreciate the associated structure as related to models that behave as with path dependence patterns. In this case we find that given the problems to identify and recognize informal land owners and informal workers, this two variables generate this kind of behavior as in the archetype success to the successful (See Fig. 5).

The reinforcing loops tend to increment the “success” of an actor given the case of a competition between enterprises. What it does basically is that when an actor is successful, it gains more resources that allows to increase their advantage.

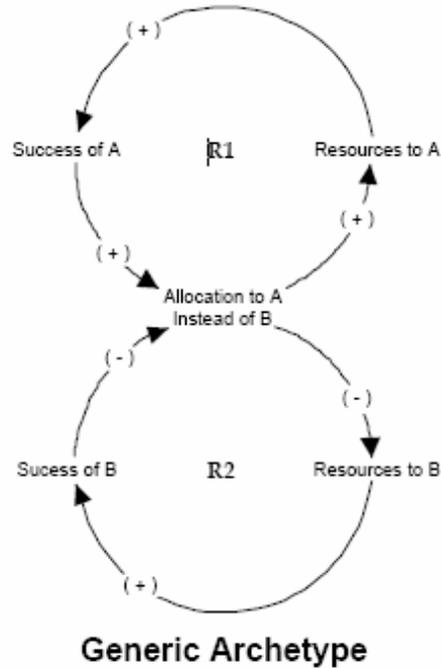


Figure 5
An archetype for reinforcing processes (source: Braun 2002).

In the case of the informal economy this definition of success really is a problem for society and development. This is because when some kind of property ownership — for example the illegal ones — becomes bigger, the government has more problems identifying the “informal” real estate, causing that the cost of the government will increase the difficulty to identify or process information related to informal real estate properties; this difficulty includes the problems related to the identification of properties for tax collection, contract verification, information acquisition, which taken together encourage people to search for informal alternatives that seem more “competitive” — e.g. less expensive — that finally will make the government more limited for regaining competitiveness towards legalization of workers and real estate properties.

IV. Outlook and Next Steps

We have presented a model that has several elements to consider (within their development as well for future investigations), following this previous discussion we propose several elements that will be considered in the formal construction of the model or in the formulation of policies within these restrictions:

- Land ownership only refers to housing, not to rural real state.
- ¿How the amount of capital affects the risk within transactions, and therefore the capability of persons to become legal?
- ¿How the risk affects the formalization of property rights?
- ¿How the amount of savings in the economy increases or decreases the capability of sustaining a higher risk?
- Following Saeed's statements, when informality is associated with technology, it causes that the production becomes limited because their technology will be restrained by the difficulty to acquire loans (Saeed & Prankprakma, 1997, p 171)
- How technological development, and technological restraints can catalyze the capital generation within a society? (Saeed & Prankprakma, 1997, p 158)

Furthermore, a running System Dynamics simulation model provides a way to test the basic claims of the theory; this might bring an important viewpoint to the academic debate aspect since the theory of De Soto is not free of criticism. For instance, from a feasibility viewpoint, Culpepper (2002) is skeptical about the viability of a real reform of property systems in Third World countries. Moreover, Gravois (2005) rejects a supposed universality pretension of de Soto's proposal, which is connected with the criticism of Samuelson (2001) pointing at the cultural diversity that is neglected by de Soto (see also Gilbert 2000). There is also methodological criticism; for example Rossini and Thomas (1990) challenge the statistical basis for estimating the size of the grey economy in de Soto's research. Similarly, Woodruff (2001) suggests a gross overestimation of the amount of informal wealth. Furthermore, Bunting (2000) rejects the very core of the theory and labels it as a flawed idea because it underestimates the benefits of staying out of the legal system. Nevertheless, the theory has had a good

reception in several places, specially by various governments and multilateral organisms like the World Bank; for instance different countries of Latin America have requested advice regarding the reform of property and regulatory systems based on these ideas; moreover, China, Thailand and Brazil have already started reforms inspired by the work of de Soto. However, its use is not widespread; apart from the mentioned criticism, this might be explained by the fact that it is a very basic idea that generates skepticism because of its simplicity and also because of its counterintuitive ground. To build a simulation model may help to communicate and show the power of the theory. A model is also a useful tool to dispel the potential skepticism through testing and simulation; it can also complement and strengthen the weak points of the theory that can surface via simulation.. It can also help to generate support for it through the validation possibilities that it offers. For instance, validating the model structurally as well as behaviorally, e.g. Barlas, 1996, should help to determine whether the assumptions and basic logic behind the theory are sound and that there is consistency between its major claims and the results shown in the runs. It does not imply that the theory *is* true but what it may show is that its claims are plausible, possible, and consistent with its assumptions. What's more, the simulation model provides a way to enrich the debate. We intend to give some general insights we are gathering during this undertaking about using System Dynamics modeling for communicating, testing and validating theories.

In the long run the project should follow two major steps: First, formal definition and rigorous tests of the theory should be developed; using real data we can retrace and compare the economic growth through the history of developed and underdeveloped countries. Second, the design of different scenarios where the missing information becomes “visible” or where the delays associated to the process of becoming legal are shortened, will allow to appreciate the real magnitude and relevance of possible policies based on de Soto’s theory.

As a final reflection, perhaps there is a subtle benefit of this enterprise: the model can show the necessity of addressing a phenomenon that is taken for granted in the West but that is missing in Third World countries. The visualization and communication of these ideas using System Dynamics might widen the range of the academic discussion

which should mean only a better debate and surely higher chances of addressing better the problems of marginalized regions of the world.

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