

Endogenous Liquidity in Developing Countries

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Abstract:

Based on principles such as a non-ergodic monetary economy and the predominance of aggregate demand over supply, Post Keynesian theories of the *Finance-Funding Process* and *Endogenous Money* are oriented to explain the money creation-destruction process and its effect on economic performance. However, even within the Post Keynesian School there are different approaches to the way the main variables in these theories operate.

In addition, and to a large degree, the central focus of Post Keynesian monetary theories has been to explain the operations in advanced economies like the US and UK. While the core ideas are relevant for all market economies, the models are missing key features that are useful to explain how these processes operate in less developed market economies. Specifically, the main characteristics for less developed economies include: 1) the local currency (peso) is typically not accepted as a means of exchange in international transactions, so domestic banks (including the central bank) must maintain foreign currency reserves (dollar) in order to make international transactions, moreover these hard currency reserves also provide “credibility” for domestic currency to circulate in internal markets; 2) in many less developed countries stock and bond markets are not well developed so other types of financial instruments are used as stores of value; 3) the Balance of Payments restrictions to growth asserted by Thirlwall (1982; 2003) are not compatible with the Post Keynesian theory of the money creation-destruction process; 4) there are institutional differences regarding monetary control (for example, there are no reserve requirements on commercial banks in Mexico); last, 5) as pointed out by Moore, there is an unresolved problem regarding the consistent use of the Keynesian multiplier and velocity of money circulation categories, and, as we discuss, this further complicates the case of an economy that requires international reserves in order to validate circulation of its own currency.

In this paper we propose a Post Keynesian model that incorporates all of these additional features of less developed economies, and we use the case of Mexico to present empirical evidence for our arguments. We show that a specific endogenous money process for a developing country (like Mexico) should be based on banking system and that in this context the ambiguity pointed out by Moore about velocity of money circulation and the Keynesian multipliers disappears. Finally, we show that, in a less developed economy like Mexico, the interest rate is determined by the use of alternative sources of liquidity, and that a local currency expansion will be followed by an increase in the interest rate which can lead to a recession or other crisis scenarios.

Introduction

Based on principles such as a non-ergodic monetary economy and the consequent predominance of demand over supply, Post Keynesian theories (PKT) of the *finance-funding process* and *endogenous money* are oriented toward explaining the money creation-destruction process and its effect on economic performance. However, within the Post Keynesian school there are different approaches to the way the main variables in these theories operate; but, in most cases, this approach has been developed as a closed-economy, one currency case perhaps because they were originally developed to explain the American and British economies.

In this paper we depart from the fundamental Post Keynesian principle that money is created and destroyed from bank credit because the approach developed for a single currency case does not adequately explain the case of developing market economies (as Mexico). Specifically, there are institutional features of developing economies that complicate the endogenous money process. In this paper we use Mexico as a case study to illustrate the arguments. The main characteristics that differentiate developing economies like Mexico include: 1) the local currency (peso) is not accepted as a means of exchange in international transactions, so, in order to circulate in internal markets, domestic banks (including the central bank) need foreign currency reserves (dollar) to make international transactions; 2) in many less developed countries stock and bond markets are not well-developed, so they do not play a crucial role in the process of converting short term credits to long term instruments; 3) the Balance of Payments restriction to growth asserted by Thirlwall (1982; 2003) is not compatible with the PK theory of endogenous money.

In this paper we propose a simple model that includes these additional features, and we use the Mexican case to present empirical evidence to support our arguments. Instead of a broad concept of money, we use a specific aggregate of local bank accounts to define “liquidity” (the argument justifying this approach is presented in section two). Liquidity, as we will define, refers to a national, less-developed-country currency that is not accepted in international markets to set contracts, but is widely used in local market transactions because, by law, it is able to cancel debt. The endogenous liquidity process that we propose refers to the mechanisms used to inject liquidity from alternative

sources of foreign and local credit, and withdraw liquidity through amortizations and other bank debt instruments. These mechanisms operate to constrain or expand aggregate spending; however, changes in aggregate demand are expressed in domestic markets through changes in liquidity.

We show that foreign flows create a constraint to liquidity creation, and this constraint is compatible with Thirlwall's Law. Finally, we conclude that in less developed economies like Mexico the interest rate is determined by the use of alternative sources of liquidity (domestic credit or international credit); and, as opposed to the single currency case, a local currency expansion will be followed by an increase in the interest rate which can foster crisis scenarios.

1.- Post Keynesian Approaches and the Less Developed Economy Circumstances

While Post Keynesian economists agree that money is endogenously determined by demand-driven credit, differences still persist with regard to the mechanisms that guarantee this result, especially regarding the interest rate determination process (liquidity preference vs. mark-up approach). However, these approaches share an institutional framework that refers to a developed economy where the only (at least the dominant) source of money is the domestic commercial bank credit.

In the Post Keynesian Finance-Funding Theory, which is based on Keynes's Revolving Fund Theory, money is created by banks in order to finance new investment; the concomitant spending creates saving, and, on the other side, a bank's debtor issues tradable titles to sell in the capital markets. Savings generated from the new expenditure is then used to buy these new titles and the debtor uses funds to pay their credit: the finance-funding process has been completed. At the extreme, the only thing holding back full employment in a limitless endogenous money world is expectations that drive investment expenditures.

These theories are based on the assumption that commercial banks, in order to create all the money that is demanded, obtain required reserves from their national central bank, at least during the period of time until the finance-funding process is completed. It is also typically assumed that there are deep and broad capital markets, so that a significant amount of bank credit can eventually be

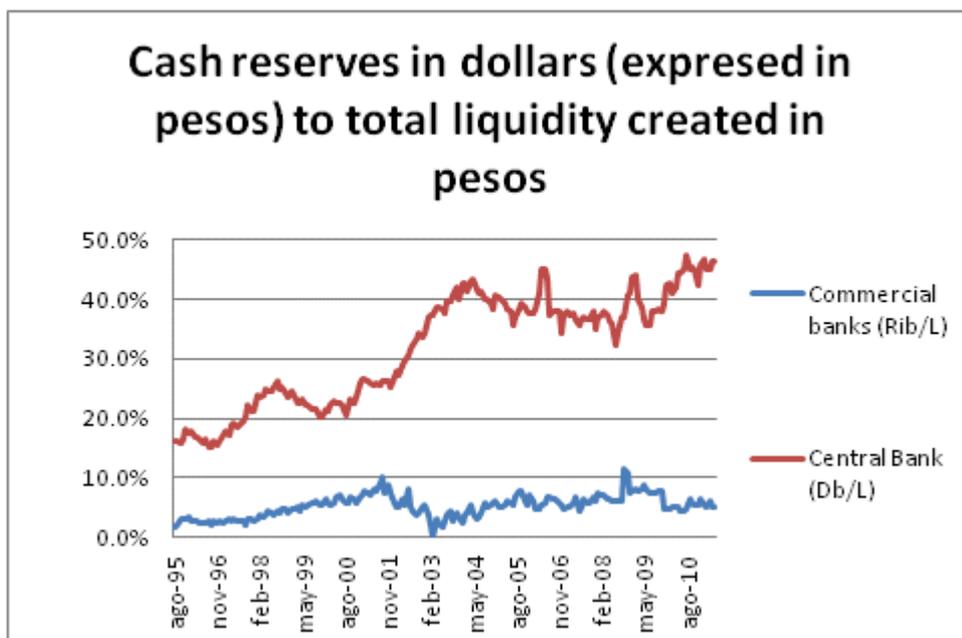
converted into long term instruments. This implies that longer term bank deposits are less significant for the finance-funding process. Since these theories typically focus on the closed-economy case, deposits of foreign currency in local banks are not considered by definition; however, these deposits can be the cornerstone of the banking system of a developing country. We argue that these assumptions are misleading for the developing market economies and we illustrate using the Mexican case.

1.1.Foreign Currency as a Necessary Bank Reserve.

The assumption that commercial banks need to obtain national central bank credit in order to create money ignores the hierarchical character of money in the globalized system especially in the operation of a small economy monetary system. The Mexican economy is considered part of the dollar zone, although the Mexican peso is widely used for almost all domestic exchanges in the country.

Since the peso is not accepted as a means of exchange in international commerce, and a huge part of Mexican foreign commerce is realized with the US, the dollar is the foreign currency most in demand in Mexico.

Banks in Mexico must have a significant amount of dollar reserves, not only to satisfy the foreign commercial exchange necessities, but to make their customers believe that they will have the required reserves if there is a run from peso. The central bank is not an exception. In fact, the central bank must maintain a significant amount of foreign currency reserves. Central bank reserves operate as collateral guarantees for the international debt of less developed countries. The following graph shows the evolution of the commercial and central bank's liquid foreign reserves in dollars (cash and deposits abroad) in relation to the total liquidity which includes the Central Bank's monetary base (BM) plus demand deposits in commercial banks (PM). Next we explain the particular use of the term "liquidity".



When Mexican commercial banks create liquidity, they have to obtain both central bank reserves (pesos) and foreign currency reserves (dollars) in order to satisfy the new level of commerce. If they do not, it will increase the risk of a bank crisis.

The international reserve position of the Mexican central bank is very important to guarantee the free conversion of pesos to dollars; however, commercial banks also need international reserves. These reserves allow commercial banks to offer services which are oriented to international commerce. Ultimately, the need of commercial banks to hold international currency reserves emerges from two of the principal Mexican institutional features: wide open international commerce, and unrestricted convertibility of pesos into dollars.

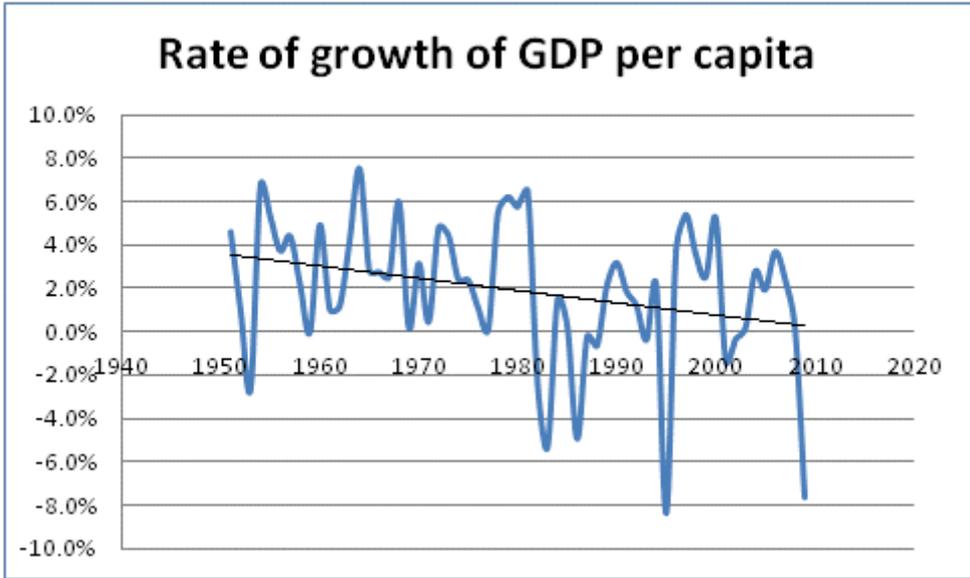
The openness of the financial system also means that huge amounts of foreign currency could be deposited in local banks in local currency accounts (since it is used for local commerce), and these flows support the creation of new local deposit (peso) currency. But foreign inflows are often used to increase, more than proportional, the domestic deposits in local banks denominated in local currency, because the foreign currency flows increase the private commercial banks holdings of international currency cash reserves.

According to Thirlwall (1982; 2003), the Balance of Payments can create a growth constraint on less developed economies, as a deficit country would need foreign currency in order to finance its

deficit (consequently, in the long run exports constrain economic growth). But the restrictions to growth asserted by Thirlwall for a less developed economy are not included in the PKT endogenous money approach. An endogenous process of money creation and destruction for a less developed economy must express the restriction that foreign reserves represent to economic growth, including the role of foreign exchange as reserves in the banks, and their role as a source of domestic money creation.

1.2. Local Currency and Domestic Transactions

During the 1980s and the first half of the 1990s, neoliberal policies brought about important changes to the institutional framework in Mexico: the economy became more open to foreign trade (Gatt and NAFTA); the public banks were sold to the private sector; the fractional reserve banking system was eliminated; the Central Bank could no longer loan directly to government (government has to issue bonds); and a policy of near zero fiscal deficit was implemented. These reforms failed to generate positive results. The next graph shows the rate of growth of GDP per capita. This indicator averaged roughly zero growth after the Neoliberal reforms, and they were followed by four major crises.



Elaborated with data of Banxico and INEGI

The recurrent economic crises (see former graph 1982, 1986, 1995, 2001 and 2008), and the concomitant inflation-devaluation of local currency, caused the dollar to become the preferred financial instrument to defend against inflation and preserve liquidity.

In order to be considered “money,” a financial asset must be accepted to cancel debts, and it must be able meet speculative and precautionary demands. Even when the definition of money is restricted to coins, bills and bank demand accounts (“narrow money”), this notion or measure is typically associated with a stock of money that can be used for speculative and other motives.

In the Mexican case, the speculative and precautionary motives are expressed as a demand for American dollars. There are three main reasons: 1) the exchange rate has shown a tendency to respond to domestic inflation, so American dollars preserve purchasing power better than Mexican pesos; 2) Mexico has a strong dependence on imported capital, and the peso is not accepted for these international transactions; 3) wealthy Mexicans have a long tradition of having bank accounts in the US, and moving money out of the country is relatively simple. These reasons help explain why in all financial crises experienced by the Mexican economy over the last forty years, there have been runs from the Mexican peso to the American dollar.

1.3. Mexican Capital Markets and the Funding Process

An endogenous money explanation for a developing country must include not only the role of central bank reserves but also the role of foreign currency used to meet commercial banks’ reserves. Another important institutional characteristic missing in many developing economies is the lack of broad and deep capital markets which act to operate as the main instrument to fund investment and cancel credits.

In many less developed countries like Mexico, stock markets do not have a crucial role for funding short term credits, so an endogenous process of money creation and destruction for a less developed economy must have an alternative way of funding a bank’s credit or the lack of it. We address this alternative funding mechanism in Section Three.

2. Liquidity

We define Liquidity (L) as the aggregate of the money created by the central bank (BM) and demand deposit balances in commercial banks (PM).

$$L = BM + PM$$

In a small, less developed economy like Mexico we consider that it is important to concentrate analytical efforts on the aggregate of demand deposits of commercial banks plus the monetary base $L = BM + PM$. We have called this aggregate measure *Liquidity* since it has a very important distinctive characteristic: **it is used almost exclusively for transactions in the domestic market and its creation/emission is restricted by foreign currency reserves.**

Certainly, in Mexico credit markets exist that issue short and long term instruments denominated in Mexican pesos, but people hold liquidity exclusively for transaction motives, since dollar deposits are a better instrument for speculative and precautionary motives. In order to avoid confusion with the traditional notions of money, we consider it useful to define liquidity as the volume of banks accounts that are used for the transactions motive--those accounts widely used in domestic commerce, and that by law can set contracts and cancel debts.

2.1. Narrow vs. Broad Concepts of Bank Debt

This concept of liquidity clearly differentiates from money since liquidity does not include stocks of public and private debt (only bank debts with the public). The usual textbook concept of money includes different stocks of credit (examples M2, M3, etc.). In fact, the use of this concept of liquidity allows us to avoid an imprecise definition of money that gives rise to inconsistencies like the so-called "Moore paradox".¹

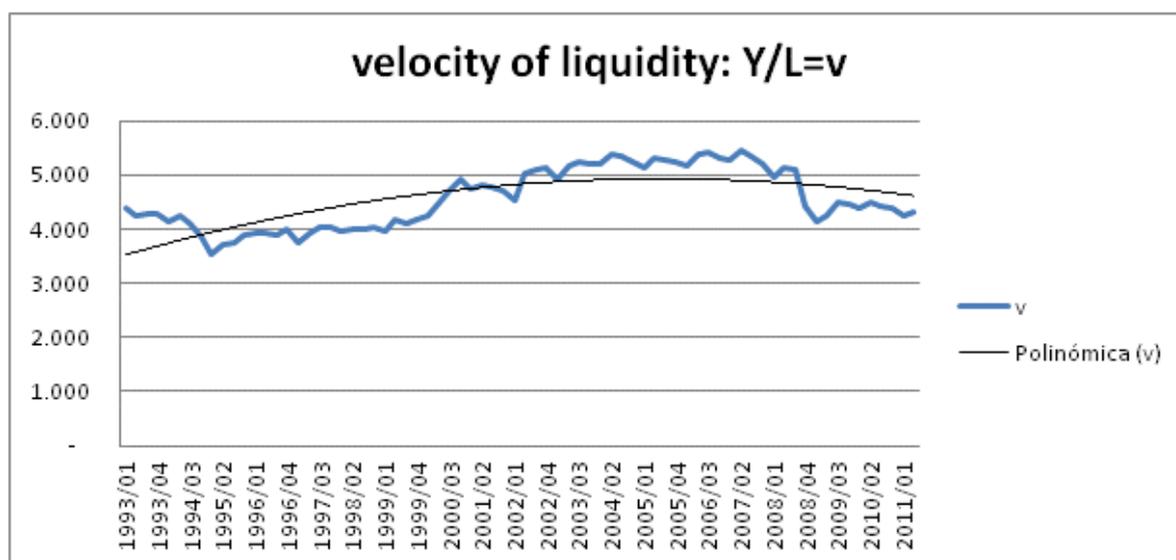
¹ The "Moore paradox" illustrates the problems that could arise if we mix the concept of money with credit. Moore (1994), claims that in monetary terms saving is, at any moment, equal to investment since deposits express the saving created by credit; if so, then the Keynesian multiplier ($1/s=m$) or the velocity of money circulation (v) are redundant and unnecessary concepts. He uses the following paradox: Keynesian Multiplier (m) has been used to express the relation between growth of GDP (dY) and growth of investment (dI): $dY = m dI$; and the quantity identity assuming prices equal 1, expresses the relation between growth of GDP to the growth of money (dM): $dY = v dM$; v is called circulation velocity. Assuming v constant, and that creation of money is equal to the credit issued to finance invest, that is $dI = dM$, then we have that $v = m$! This assertion

2.2. Evidence Linking Liquidity with GNP.

In a less developed economy like Mexico the local currency essentially operates as a medium of exchange, because the currency used for speculative and precautionary motives is the American dollar. Given the presence and role of the dollar, we should expect a close relationship between GDP and Liquidity as the quantity theorem identity suggests. That is

$$(1)... \quad L = BM + PM = (1/v) Y$$

Where Y is aggregate income and v is the velocity of liquidity circulation.²



generated a strong debate [Moore (1994), Cottrell (1994), Dalziel (1994) y Chick (1995 a)], but without a resolution. This “paradox” emerges from the association of money with credit. Liquidity, as we have defined, is not a broad concept related with government or private debt, but only banks debt that is used for transaction purpose. Then, even assuming that all new invest is financed by debt, there is no reason to assume that $dI=dL$, since private debt is not considering and the liquidity has a velocity of circulation, the new liquidity needed for transaction of an additional amount dY is defined by $dY = v (dL)$. Since $dY/dI=(m)$ and $dY/dL=v$. Then the quantity of liquidity generated in order to realize the new amount of production will be $dL = (m/v) (dI)$. The coefficient m express the potential increase in economy activity that divided by v indicates the amount of liquidity that will be necessary to the exchange of the total income created. Keynesian multiplier and liquidity-velocity of circulation are complementary concepts.

² We tested if v followed a normal distribution:

Empirical Distribution Test for V; Hypothesis: Normal; Included observations: 74 Method: Maximum Likelihood - d.f. corrected (Exact Solution)				
Parameter	Value	Std. Error	z-Statistic	Prob.
MU	4.568673	0.064011	71.37298	0
SIGMA	0.550646	0.045572	12.08305	0

The Granger causality test indicates, for lags of 1, 2 and 3 periods, that causality runs from Liquidity (L) to GNP (Y); but for 4 lags the causality is bidirectional. This indicates that the amount of Liquidity could be determined by the external sector, which would be consistent with Thirlwall's constraint on economic growth.

3. The Process of Creation, Circulation Retention, and Cancellation of Liquidity.

Post Keynesians have shown that the amount of money in circulation is defined by an endogenous process that creates and destroys bank credit. In the case of liquidity in a less developed country, this process must include the dual roles of foreign currency inflows as reserves in the commercial banks and as a source of liquidity.

The definition of liquidity must be consistent with the balance sheets of the Central Bank and Commercial Banks. We classify liquidity as credit being created by domestic commercial banks and money created abroad by commercial banks (foreign flows and central bank). This classification allows us to understand the mechanisms that an endogenous process of liquidity creation and destruction in a less developed economy must include.

3.1. Definition of Liquidity

In a developing country like Mexico liquidity (L) is constantly increased by injection of credit (domestic CR or from abroad Lx) and reduced by withdrawal of liquidity through credit cancellation or through non-monetary deposits in commercial banks (PNM).

In Mexico a part of foreign capital flows (usually credits to enterprises located in Mexico) are used to buy pesos; i.e. creating bank deposit accounts denominated in Mexican pesos. So, banks in developing countries can create liquidity by assigning credit (Ln), or through "buying" foreign currency (or lending from abroad), or from the central bank (Lx); that is,

$$\mathbf{L = Ln + Lx.}$$

We use standard balance accounts of the central bank and a representative commercial bank to account for these sources of liquidity. Considering next the commercial banks' balance sheet equation:

$$(a).. \quad CR + VG + Hb + Rib = PM + PNM + Crbx + Px + Cap$$

Where: CR: credit balance (loans); VG: federal government securities; Hb: reserves, vault cash in pesos; Rib: reserves, vault cash in dollars; PM: demand deposits (monetary liabilities); PNM: non transaction deposits; Crbx: borrowing from Central Bank; Px: banks' international debt; Cap: bank capital.

Next we consider the Central Bank Balance:

$$(b) \quad BM = CrBx + Db + DF$$

Where: BM: monetary base; Db: foreign currency reserve; DF: loans to government. Currency outstanding (BM) also is equal to (c) $BM = Hb + Hpub$. Where Hpub: currency in circulation.

Reorganizing (a) (b) (c) identities, we get: $(CR - PNM) + [(Rib + Db - Px) + (Df + Hb + VG) - (Cap)] = PM + BM$. Then we define Liquidity generated by commercial banks using Credit (L_n) as $L_n = CR - PNM$; we also we define L_x : liquidity generated by international flows and by central bank as $L_x = [(Rib + Db - Px) + (Df + Hb + VG) - (Cap)]$.

Then, $L = BM + PM = CR - PNM + L_x$.

3.2. Local and Foreign Credit as the Main Source of Liquidity Creation

L_x is mainly integrated by domestic liquidity (named in pesos) generated from the international liquidity that arrives to the developing economy. In this sense L_x represents a form of endogenous generation of liquidity since it is not within the control of the Mexican Central Bank.

L_n represents the traditional credit driven liquidity creation ($L_n = CR - PNM$), where CR is the stock of net domestic bank credit (credit minus amortizations), and PNM is the stock of time and saving deposits at private banks (non transaction deposits). L_n increases when the amount of credit increases and it reduces when the credit is amortized (liquidity is canceled). L_n also decreases when the public makes time deposits PNM, which leads to the withdrawal of liquidity when increased.

Liquidity cancellation occurs when a credit is paid or when national currency is converted to foreign country currency. In our identity these forms of cancellation of liquidity are not explicitly presented but are considered since CR and Lx are net flows of liquidity creation. The Central Bank can withdraw liquidity from circulation using open market operations; and these operations are also part of Lx. But these operations do not imply that the Mexican Central Bank is able to control the amount of liquidity through these operations, as it cannot control the net inflow of liquidity, because that depends on the demand of foreign credit.

3.3. Mechanism of Funding

In developing countries like Mexico, the capital market does not have as relevant a role in funding investments and the consequent cancelation of excessive liquidity; so the funding process, if it exists in a less developed country, must take another form. We argue that non-transaction bank deposits, PNM, have a very important role as a withdrawal liquidity mechanism in the process that leads the effective demand to fit L.

The *Revolving Fund Theory* (Keynes, 1937)³ establishes a different role of banks from other institutions in financial markets. The banks provide financing (short-term debts that create money) and the other institutions provide funding (long-term debts). Paul Davidson states that,

...the role of banking system whose function is to create additional short-term finance whenever entrepreneurs wish to increase the flow of real investment. This bank-created (non resource using) finance must be distinguished from the role of long-term financial markets which require the public to give up an amount of liquidity equal to real savings (i.e., unexercised income claims on resources) in the process of funding the investment. (1986, 101)

The Post Keynesian Revolving Fund Theory determines that the only link between saving and liquidity occurs when enterprises issue long term debt to cancel credit that financed investment spending (this mechanism is called Funding). In Mexico only a few enterprises have access to the stock market and only a few families can buy titles in this market. Portfolio options, in addition to real estate and other real assets (that do not cancel liquidity), of many families are limited to non-

³ Carvalho: "In the 1937 paper cited above, Keynes summarized the financial requirements of the process of capital formation as follow: The entrepreneur when he decides to invest has to be satisfied on two points: firstly, that he can obtain sufficient short-term finance during the period of producing the investment; and secondly, that he can eventually fund his short-term obligations by a long-term issue on satisfactory condition [Keynes 1937, p.664]". (1997: 463-464)

transaction bank deposits (PNM), or dollar currency. Consequently, in Mexico, the funding process described by the Revolving Fund Theory is not enough to describe the mechanisms that cancel liquidity in Mexico. In Mexico, PNM operates as savings and, at the same time, as liquidity reserve.

PNM does not cancel liquidity (as is the case of credit amortizations), but withdraws liquidity from circulation (also reducing the L stock). This liquidity withdrawal mechanism (PNM) is complementary with the amortizations which occur when there is liquidity that the families or firms do not want to use in commerce. This kind of amortization is called the reflux mechanism. Lavoie says that: “if agents wind up with money that they do not want to spend, they will use it to reduce their debt.” (2001, 229)

This liquidity reduction, together with conversions of pesos into dollars, is the operative action of families’ savings that limit aggregate demand, and consequently the stock of Liquidity in circulation (L) is kept proportional to PIB (Mexican GDP). PNM deposits are a very important operative mechanism through which effective demand determines the amount of Liquidity (L).

In Mexico, similar to most countries, bank loans are not necessarily assigned to finance productive activities; sometimes loans are used to finance the acquisition of a firm or a takeover in the stock market. Since this liquidity is not assigned to the circulation that creates the gross national product (PIB), it will be withdrawn to PNM or canceled by the acquisition of monetary regulation government bonds or destined to foreign deposits. Variations in PNM could then be a consequence of not only aggregates demand changes, but the excessive Liquidity injected by credit and foreign flows as well. In fact, the primary function of PNM is to withdraw liquidity that is not going to be used in commerce.

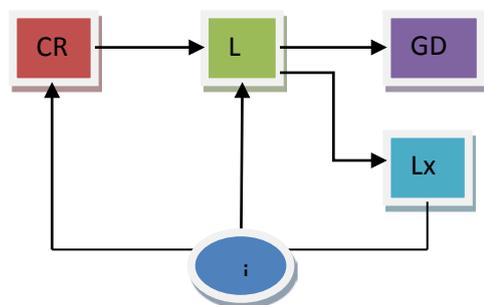
We argue that in Mexico the amount of withdrawn liquidity is guided by aggregate demand, and this amount constitutes a part of family’s savings. Thus we propose that the proportion of saving destined to PNM (and that which is converted into dollars) joined with the speed of liquidity circulation can describe the process that allows the total amount of liquidity to be adjusted to the amount of the aggregate demand.

4. Subordinated Endogenous Liquidity

In this section we test the inflows generated through the capital balance and their impact on total amount of liquidity created. As we have argued, foreign currency operates by directly creating banks deposits and by indirectly supplying the foreign reserves that banks needs to create domestic liquidity credit.

We tested foreign flows as the main constraint on liquidity expansion, the monetary side of the Thirlwall's Law. The OLS test shows a significant relation between the variation in foreign capital inflows and the variations of the stock of liquidity,⁴ but Granger causality test do not reject that liquidity precludes foreign capital inflows (for 2 to 6 lags). According to the general theory of endogenous money the Granger causality test indicates that $CR \Rightarrow L$ for 2 and 3 lags; but using greater lags, it becomes bidirectional. We obtain similar result using granger causality test to validate $CR \Rightarrow Lx$: for 2 lags it is not rejected, but with greater lags it becomes bidirectional.

These results are in accordance with our proposition that liquidity is created in response to domestic credit demand but the amount of liquidity created is constrained by foreign reserves.



5. Endogenous Liquidity and the Interest Rate.

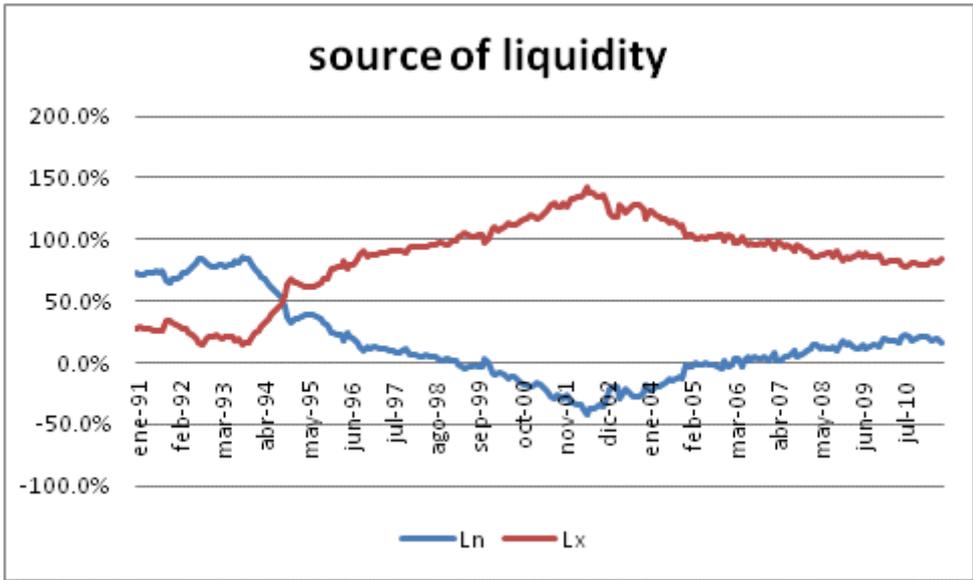
The next graph shows the evolution of the source of liquidity in Mexico. After the bank crisis of 1995, foreign flows became the most important source of liquidity for the Mexican economy. Before

Method: Least Squares; Included observations: 73 after adjustments					
dependent variable	D(BK\$)	D(BKDLLS)	D(ACUMBK)	D(X)	C
D(L)	* 0.319301				* 39415.14
D(L)		* 2.819224		* -14.39294	* 43309.73
D(L)			* 0.495824	* -15.03818	* 23220.19

*significativa al menos al 90%

4

this crisis, international reserves came mainly from international credit to Mexican commercial banks. International reserves cannot be obtained without cost, so the link between liquidity and interest rate must be obtained through international reserves. The Post Keynesian endogenous money theory affirms that once a commercial bank credit has been created, banks begin to search for the necessary reserves of the central bank that can support circulation of the money created. In Mexico, the private banks require not only reserves from the central bank (Banxico), but also a significant amount of foreign currencies (American dollars essentially).



The actions of commercial banks to obtain local (central bank) and international reserves are related to the alternative use of the sources of liquidity and the corresponding level of the domestic interest rate. Consequently, even though the main Post Keynesian principles are kept, the particular current Mexican circumstances define a process that determines the source of liquidity used at any moment and the corresponding interest rate. This process is, in many aspects, different from the ones presented in Post Keynesian literature, including open economy analysis.

5.1. The Interest Rate and Reserve Demand.

Let us begin with the extreme case analyzed by the Post Keynesian endogenous money literature: the situation that occurs when the commercial bank has created such a great amount of liquidity that the reserves created through the fiscal deficit cannot satisfy the commercial banks' reserve requirements and the central banks (for any absurd consideration) refuse to deliver it. Thinking of that circumstance, Randall Wray argues that:

...still, one could argue that the central bank could hold fast in a situation of deficit reserves, allowing interest rates to rise as high necessary to force banks to economize and perhaps even shrink their balance sheets by selling assets. Note, however, that sales of assets cannot actually increase aggregate reserves (except in the unlikely event that households use cash hoards to buy bank assets) and that the demand for reserves is interest-inelastic. Thus, the impact on overnight rates could be very great and a high degree of instability would have to be accepted as the consequence of central bank refusal of reserves. (1998, 105)

In the Mexican case, however, sales of banks' assets can increase aggregate reserves if banks can obtain foreign currency. In that form they directly obtain international liquidity reserves and they can sell dollars to Banxico (Central Bank--fixed exchange regimen) or to the public to obtain peso reserves. In fact, during the first half of the last decade (the period prior to the 1995 crisis) the principal form used by private banks in Mexico to get national and foreign reserves was international credit-dollar titled.

Finally, the demand for reserves is not interest rate inelastic, as it will be argued below, because an increase in the interest rate induces the substitution of liquidity generated by domestic credit to Liquidity generated by foreign flows; this substitution reduces the domestic credit demand and satisfies the banks' demand for foreign reserves.

5.2. The Interest Rate and Liquidity Creation: SNPU

Here it is proposed that the interest rate and the dominant source of liquidity are jointly determined, and the connection between these variables is given by both kinds of commercial bank reserve stocks. Specifically, it is proposed that if domestic bank credit increases [decrease] without any complementary increase [decrease] of foreign inflows, and consequently the amount of needed reserves increases [decreases], the interest rate increases [decreases] and incites substitution of

liquidity generated through domestic credit $-L_n$ [Liquidity generated by foreign flows $-L_x$] by liquidity originated through foreign flows $-L_x$ [Liquidity generated by domestic credit $-L_n$]. While this substitution is operating, the interest rate will gradually decrease [increase] and the substitution between sources of liquidity will reverse.

To show this, we use the accounting identity $L = PM + BM = CR - PNM + L_x$ to define the net account of the public with the banks (SNPU by Spanish “abbreviation”) that can represent the relation between the sources of Liquidity:

$$SNPU = PM + PNM - CR = L_x - BM$$

A positive variation of SNPU indicates that L_x is the dominant source of liquidity and a negative variation indicates that the domestic bank credit is the dominant source over the considered period.

In Mexico, the interest rate operates as a switch that establishes which of the sources of liquidity will predominate. This predominance is expressed in SNPU. But feedback exists since the interest rate is determined by the relative contribution to the amount of liquidity from the different sources of liquidity.

To illustrate, let us consider a situation in which the Mexican interest rate has been reduced and is so low that, considering expectations, it is better to borrow from national banks than from international ones. When the credit is realized, the PM (liquidity) emerges and starts its circulation. While this liquidity is circulating, part of it is exchanged for cash or is drawn off to foreign currencies, generally dollars; consequently a corresponding amount of the PM created is canceled. This means, that when the interest rate has gone down, SNPU will follow this reduction because the PM level is lower than the initial level (when liquidity was created). This reduction forces private banks to obtain an equivalent amount of reserves composed by both kinds of currencies.

In Mexico, private banks can obtain reserves from Banxico (the central bank), foreign lenders, or even from the public. Of course, they must consider the accessibility and expectations about cost. But whatever the commercial banks did to obtain national and foreign reserves, it will put pressure on the interest rate. If the policy of Banxico (Mexican central bank) is to deliver all the reserves required by the commercial banks, Banxico will increase the interest rate trying to reduce the demand for

international reserves. If a fixed exchange rate regimen is applied (as it was around the first half of the last decade) and Banxico refuses to increase reserves, the private banks can obtain both kinds of reserves that they need by borrowing from international markets and then selling these foreign currencies to Banxico. International lenders will increase the risk premium of the interest rate to Mexican banks' credits. If the regimen is a floating exchange rate (as it is from the last half of the 90's until today), banks can either obtain foreign credit with the consequential increase in risk premium, or they can demand dollars in the local market.

However, this demand from commercial banks will pressure the exchange rate to increase and, consequently, the cost of international credit (evaluated in pesos), and the interest rate. Additionally, in any case, private banks could try to increase the non-transactions deposits (PNM) by raising the corresponding interest rate to obtain pesos reserves and reduce the public demand of currency and international liquidity.

The interest rate increase that is a consequence of an increase in domestic bank credit can be characterized as "natural", since a part of the liquidity generated by credit will be turn into dollars and Mexico cannot "produce" dollars. In the absence of extraordinary inflows of international liquidity to Mexico, an increase in domestic commercial bank credit will increase the interest rate.

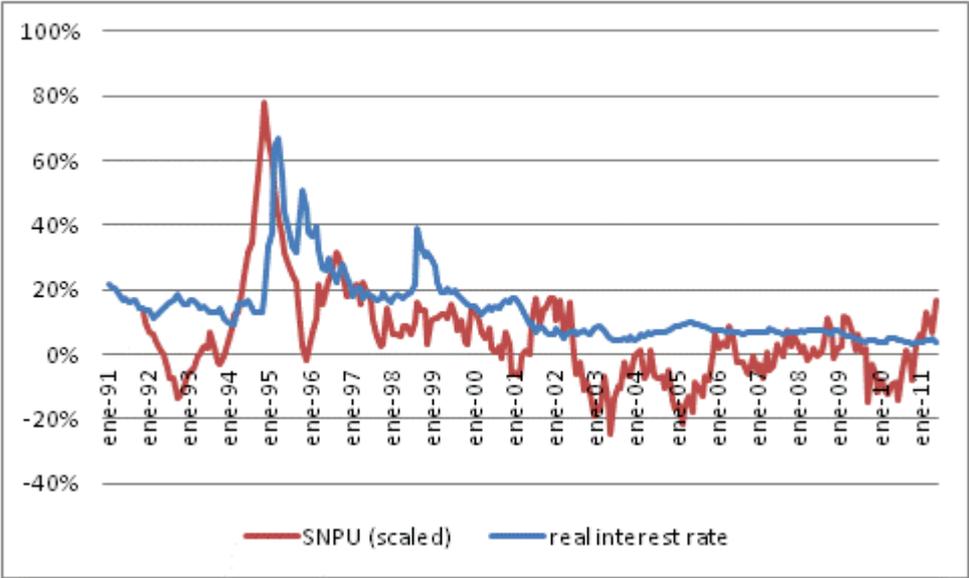
When the interest rate has increased enough to induce big firms, those which have access to foreign credit, to prefer this source of liquidity and the other firms (those without access to foreign credit) to reduce their demand for commercial banks' credit, the commercial bank liabilities will grow more than their credits. Therefore, SNPU will decrease and the flow of international liquidity will cause pressure to reduce the interest rate, thus starting another cycle.

5.3. The Relationship Between Interest Rates and SNPU

In Mexico the interest rate is oscillating with relation to the levels and origin of the flows of liquidity, but fluctuations in the interest rate induce a trade-off between the sources of liquidity expressed in variations of the SNPU. These fluctuations of sources of liquidity (projected on SNPU

variations) and the corresponding adjustments of the interest rate guarantee the endogenous generation of national and foreign reserves.

The next graph shows the monthly series of average annual interest rate (cetes 28 days), and the annual average of real monthly variations of the Net Public Debt with the private bank, named “AASNPU”.



Based on series published by INEGI, CNBV y Banxico

We propose that the interest rate defines the balance between liquidity generated by domestic banks and liquidity generated from foreign flows. We attempt to capture this balance in the variable SNPU. The econometric evaluation of the relation between AASNPU and real interest rates indicates a significant statistical relation.⁵ The Granger Causality Test shows that causality runs from AASNPU to interest rate. If we test using a greater number of lags, the causality results are bi-directional. This can be considered as support for the proposition that the

5

Method: Least Squares; Included observations: 169 after adjustments						
dependent variable	AADSNPU *	AADSNPU(-3) *	AADSNPU(-4) *	AR(1) *	AR(2) *	C *
i	-4.76E-06			0.953927		0.166287
i		1.02E-05		0.925625		0.157678
i		9.47E-06	1.05E-05	1.125044	-0.243312	0.146109

*significativa al menos al 90%

creation of liquidity using domestic credit gradually induces a move to increase of the interest rate.

Consequently, an increase in spending financed by domestic credit expansion can only be sustained, without a considerable increase of the interest rate, if there is an autonomous and simultaneous expansion of foreign flows strong enough to generate a level of foreign reserves consistent with what the domestic credit expansion requires.

Thus, the Mexican economy is unable to self-finance its development because an expansion cannot be sustained through the national credit without proportional responses of the interest rate and the rate of exchange. Since Mexican credit can only grow leveraged on the dollar, one could say that the Mexican peso is a subordinate coin.

Conclusion

Based on the Post Keynesian principle that money is endogenously created by demand-driven credit, it was argued that some particular institutional characteristics of the Mexican monetary system define a specific operative form of this endogenous process of money generation. These institutional features define the process of injection and withdrawal of liquidity that allows the liquidity to be determined by the domestic bank credit constrained by foreign currency reserves that respond to aggregate demand.

In Mexico, commercial bank credit is not the only source of liquidity; foreign flows play an important role as a source of liquidity. At the same time, foreign flows generate international reserves that support the peso circulation and allow Mexican banks to supply services oriented to international exchange. This means that any proposal concerned with the creation and circulation of money in Mexico must explicitly include the role of foreign currency flows.

We explicitly included in our model foreign flows and found, under the present institutional framework, the Mexican financial system cannot self-finance a sustained growth of spending because any expansion requires a concomitant flow of international liquidity (dollar reserves) to support domestic credit creation. Without these international flows, an increase of domestic credit induces a

rise in the interest rate that could exhaust the expansion or detonate a crisis. The interest rate is determined by the alternating dominant sources of liquidity: between liquidity generated by foreign flows, and liquidity generated by domestic commercial bank credit.

In the same way, Mexican institutional features play an important role in the determination of the mechanism of liquidity cancellation. The principal mechanisms of withdrawing liquidity, without considering the conversions of pesos to dollars, are the PNM and Regulatory Government Bonds. Neither of these instruments is directly linked to the cancellation of commercial bank credit. This means that the process of funding, and the consequential withdrawal of liquidity, described by the Post Keynesian Theory of Revolving Fund is not a good description of the Mexican process of liquidity withdrawal. This characteristic points out another important weakness of the Mexican financial system, the lack of a mechanism for funding domestic commercial bank credit.

Under these circumstances, Mexico requires a financial development policy that incorporates an explicit strategy towards foreign (dollar) flows and their role as indispensable bank reserves. The administration of the interest rate could only be possible if it is operated simultaneously with a bank credit policy and a policy to foreign flows. In Mexico it is also necessary to incorporate mechanisms of funding that can substitute PNM and the regulatory state bonds as mechanisms of withdrawal of liquidity.

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