

The Integration of the stamped money issue into the general equilibrium models

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Abstract:

The “Debt Deflation Theory” provided by professor Irving Fisher showed how the efforts of the Central Bank to restart the American economy were not successful during the Great Depression of the 30s. He proposes so as an alternative solution the use of a stamped currency. In this paper we analyze from a theoretical perspective this proposal, looking at the consequences of the introduction of the demurrage in the Goods Market. Through a practical case we discuss how the stamped money can be introduced in a city and how to handle the problems arising from the reconversion issue. In the last section we analyse the Silvio Gesell’s proposal of completely substituting the national currency with a demurrage, by looking at the effects on the money market model and on the IS LM model.

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1. Introduction

When we first encountered the stamped money issue, we immediately realized that this currency system would have had many consequences both from the theoretical and the practical perspective. In order to study this new field of the monetary theory we firstly wanted to understand when, where and why this new alternative was born. Hence we started by analyzing the studies of Silvio Gesell, a German merchant who theorized for the first time in the book “The Natural Economic Order” (1906) a “free currency” different from the usual ones. Later on we found that Irving Fisher in the book “Stamp Scrip” (1933) enlists the usage of the stamped currency as a solution for the Great Depression, even if his positions slightly differ from the German author’s ones. The two authors focused their efforts in understanding the true working of the stamped money; in this paper we try to see if their conclusions could be interpreted from the modern economic theory perspective. In order to do so, we introduce for the first time the stamped currency into the models describing the behavior of the goods’ market and of the money market, therefore analyzing the consequences in the IS/LM model. This is helpful also to understand and to appreciate the differences between Gesell’s and Fisher’s theories: the German author hypothesizes a system in which the stamped money is the only currency, while the American professor supposes a model in which both the “regular” and the stamped currency exist. Starting from these hypotheses and from a banking system based on two separated accounts, we rearrange the general equilibrium models providing some interesting conclusions. We also describe the practical working of the “demurrage”: doing this we try to understand how this particular currency can be handled and what are the problems that can arise in some issues when converting the stamped money into a regular currency. In this paper we therefore analyze the crisis America faced in the 30s; then we focus on the alternative solution Fisher provided, using the models we described above. In the third section we discuss about the Schwanenkirchen case as an emblematic example of the application of Gesell’s currency. In the fourth part we try to formalize how the stamped money system can be managed once it is issued by a public authority in a local environment, and the practical problems that can arise when converting the “demurrage” into the official currency. In the last section we focus on the proposal put forward by Silvio Gesell of fully basing the monetary system on the stamped currency, analyzing this hypothetical situation through the models we presented before.

2. The Great Depression

During the 1920s the United States were facing a period of great prosperity and development: between 1923 and 1929 the industrial production increased by 30% and the national income by 25%. Many citizens were attracted by the stock market, asking the banks for great quantities of money to invest. The European economy was depending almost entirely from the United States' one, which was financing the recovery from the Great War and exporting several products in Europe. In order to face this demand rise coming from the "Old continent", American firms had to borrow money from the banks. This high debt load, together with the relevance of the European demand in the American market, led to an unstable and dangerous situation. Indeed, when the funds initially addressed to the European market were transferred back in the USA due to the revenues Wall Street seemed to yield, the European demand collapsed, since it was almost entirely financed by these funds. This situation led to a decrease in the American exports, in the level of prices and in the national income. Consequentially the boost in the quotation of the American firms at Wall Street was not supported by an increase in the production, pumping up a speculative bubble. When investors started to lose trust in the market, the crisis began: the stock price level decreased by 23% in 48 hours, the industrial production by 10% in one month. More than 4000 banks went bankrupt, provoking a reduction in the money supply, even if the FED tried to inject huge amounts of liquidity into the system.

3. The theories of Irving Fisher

Irving Fisher, analyzing the crisis, developed the so called Debt Deflation Theory. It is useful to recall it because it highlights the importance of a currency's velocity of circulation. This theory assumes that the economic system is characterized by an excess of debt load; if, for any reason, the level of trust of the economic agents changes, the effect is straightforward:

- The majority of the goods is sold in order to gain immediate liquidity.
- With the liquidity acquired the loans are paid back, reducing the bank deposits.
- The lack of trust slows down the currency's velocity of circulation; the level of prices is pushed down due to the unbalance between demand and supply. This situation of uncertainty leads consumers to save more, reducing consumption and so demand.
- The price reduction increases the value of the debt in real terms: in the balance sheet of the firms liabilities grow, reducing the "net worth".
- The worsening of the industrial situation leads to the first bankruptcies, a reduction of firms' profits, and a reduction of output, of the investments and of the employment.

The total effect is an additional increase of savings, slowing down further the velocity of circulation. Fisher highlights the relevance of the continuous reduction in the price level: in many of his writings we can read the word "Reflation". Inside his paper "Stamp Scrip" (1933), Fisher analyzes the Herbert Hoover's plan, in which the president tried to restart the American economy implementing an anti deflationary policy. Through several open market operations, the FED started to inject a huge stream of liquidity into the bank system; after an initial phase where this operation seemed to be successful, the economy continued to collapse. Fisher attributes this failure to a simple reason: the subsidies were assigned only to the productive sector and not to the consumers. This process causes a particular situation of paralysis: the banks were ready to lend to firms the liquidity they needed to restart the production, but firms would not have borrowed any money until the consumers had restarted to save less and to spend more. Nevertheless the consumers needed

to receive from the government, in the form of subsidies, the purchasing power necessary to restart the consumption cycle. Therefore the liquidity was running through a funnel-shaped tunnel: a huge stream of money entered the banks, but just a low percentage of it reached the market. In this situation Fisher provides as a possible solution the introduction of a stamped currency. The core idea of this proposal is based on the quantitative theory of money Fisher developed in 1911. Indeed he focuses on the velocity of circulation: in a stamped currency based system hoarding costs, therefore saving is not convenient. Indeed, if we withhold a “demurrage” currency we would have to pay at every deadline the tax on liquidity. Hence if we look at this situation from the quantitative theory of money perspective we will see that since

$$MV = PY$$

Increasing the value of V, keeping M constant, results in a rise in P or Y or both of them. This can start the process of “reflation” that Fisher was looking for, restarting the economy and avoiding the negative aspects of the debt deflation theory. Many criticisms arose to this equation, and in the current days it has been replaced by other models explaining the general equilibrium from different aspects. For this reason we try to analyze the behavior of the stamped currency through the General equilibrium models.

3.1 Theoretical Considerations

As we said before, The American Economist thought the stamped money as a temporary and local solution, which has to be introduced in a period of crisis and then has to be retired when it reaches the goals it was implemented for. Hence the demurrage in Fisher’s analysis has to be considered as a complementary currency to the national monetary system and not as a substitute of it, able to circulate only in a specific area. It has to be issued by hiring new workers and fully paying them with the stamped currency, or by replacing a part of the public employees’ wages with this demurrage¹. At the same time in which the stamped money is issued, a guarantee fund national currency denominated of the same value has to be put aside. The fund is also useful for the currency conversion into official money as we will see later on. Now we discuss what the introduction of the new currency implies in theoretical terms looking at the equilibrium model in the market of goods.

The equilibrium in the goods market is described as:

$$Y = c_0 + c_1Y - c_1T + I + G$$

Where the left side of equation is the supply of goods Y, while the left side is the demand of goods ZZ

c_0 Is the autonomous consumption

c_1 Is the marginal propensity to consumption

T Represents the taxes

I Is the level of investments

G Is the public expenditure

¹ This solution is preferable because it keeps the monetary base constant.

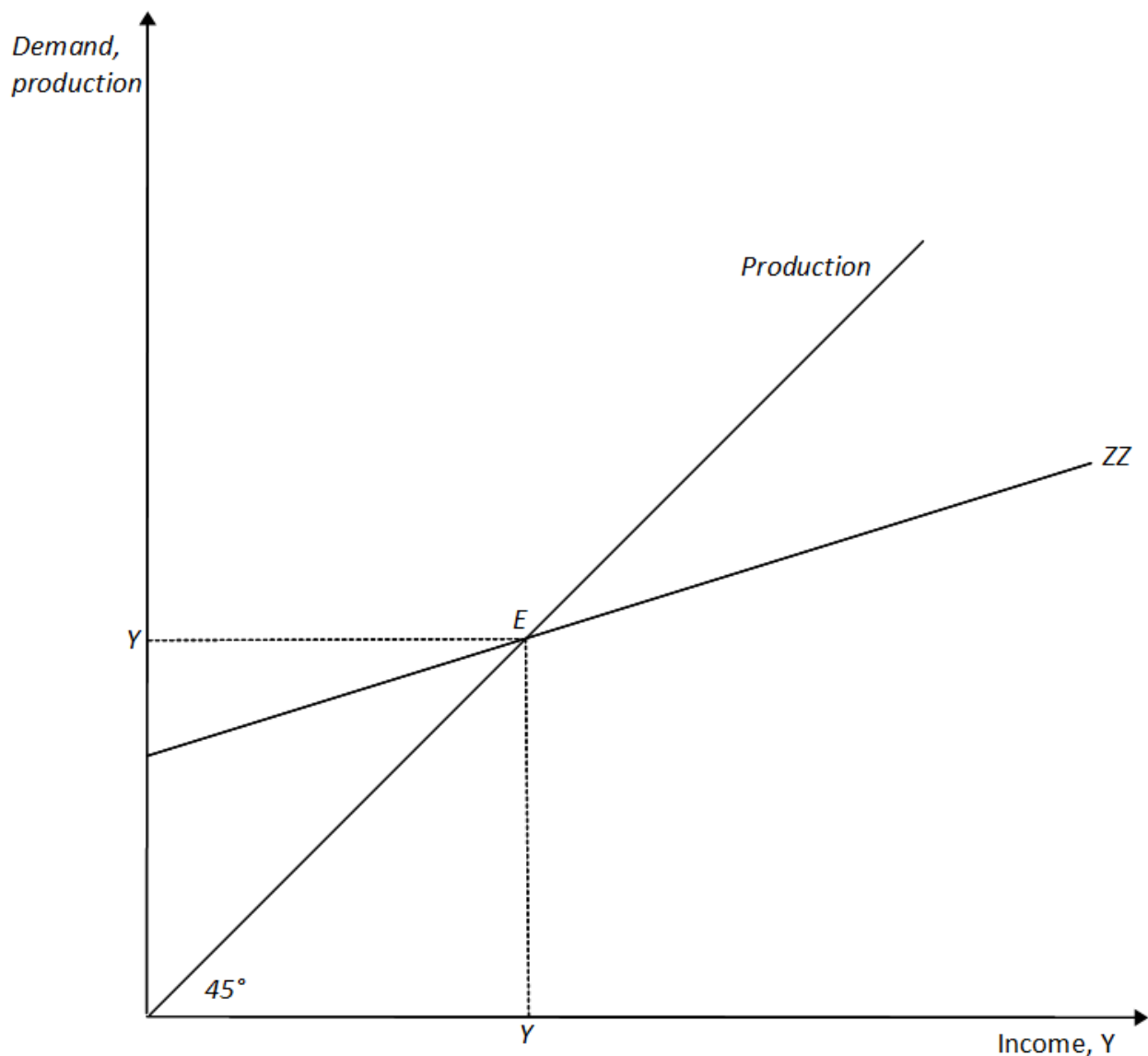


Figure 1: the equilibrium in the goods market

The stamped money, once introduced, changes the equilibrium modifying the consumption attitude of consumers. The marginal propensity to consumption c_1 is usually defined as “the effect on consumption of an additional euro of disposable income” (Blanchard, 2006 p.64). This statement is referred to the national currency, the Euro; therefore we need to introduce, inside the marginal propensity to consumption, the possibility that the additional unity of disposable income is in the form of a demurrage. We cannot think that the stamped currency has the same marginal propensity to consumption² of the official currency: the tax on

² We will call the marginal propensity to consumption of the stamped currency c_1^s

liquidity pushes the economic agents to get rid of the money, anticipating the consumption choices; hence the marginal propensity to consumption of the stamped currency is higher than the marginal propensity of the national currency. Moreover, the marginal propensity of the official currency does not change; as a result, depending on what currency the agent owns his choices of consumption will be different. Therefore how can we calculate the total propensity to consumption of the citizens? We can obtain the total effect by calculating the sum between $c_1^{\text{€}}$ times the probability of holding the national currency and c_1^s times the probability of holding the stamped money. In other terms we calculate the expected value of the marginal propensity to consumption of the double-currency system:

$$E(c_1^{\text{tot}}) = c_1^{\text{€}}P(\text{€}) + c_1^s P(s)$$

The probability of holding Euros is equal to the quantity of Euros divided by the total quantity of money in the system (the sum between the stamped money quantity and the national currency quantity). The probability of holding the demurrage is one minus the probability of holding Euros.

$E(c_1^{\text{tot}}) = c_1^{\text{€}}P(\text{€}) + c_1^s P(s)$ is larger than the value of the marginal propensity to consumption of the system without the stamped currency, $c_1^{\text{€}}$; this happens because:

$$c_1^{\text{€}} > c_1^{\text{€}}P(\text{€}) + c_1^s P(s) \text{ only when } c_1^{\text{€}} > c_1^s, \text{ but this contradicts our initial hypothesis.}$$

Including in the equation of the demand of goods the increase of the marginal propensity to consumption (we keep the autonomous consumption fixed) we obtain:

$$Y = c_0 + c_1^{\text{tot}} Y - c_1^{\text{tot}} T + I + G$$

From a graphical point of view this increase will change the slope of the demand curve ZZ , moving the equilibrium from E to E' .

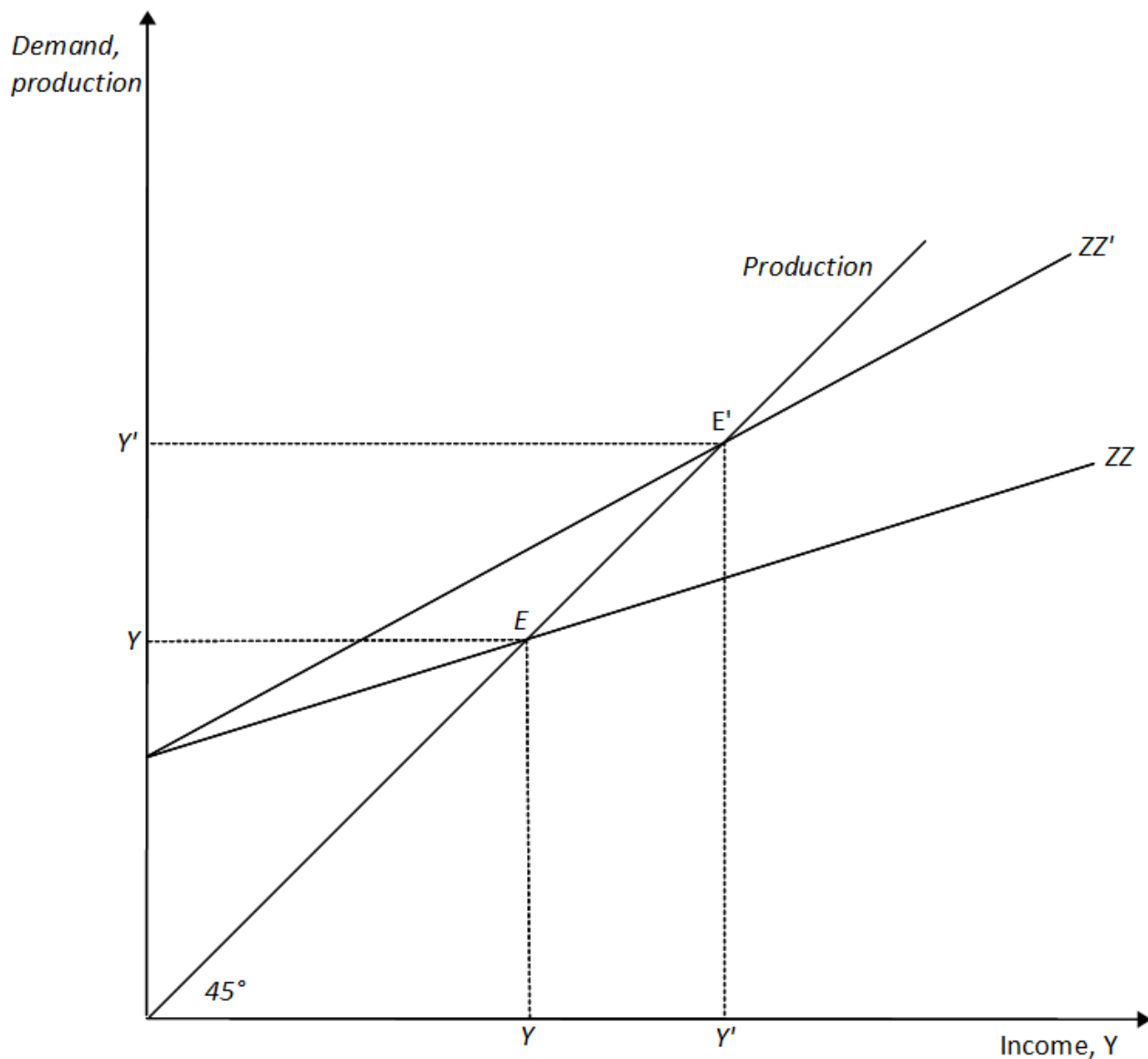


Figure 2: the new equilibrium after the introduction of the stamped money: from E to E'

Therefore the equilibrium income increases from Y to Y' . Furthermore, we have been considering only a closed economy, and so imports and exports have not been included in the model. The stamped money cannot circulate outside the local territory; it is fully spent inside it. This peculiarity allows the local production to increase, since the multinational companies, having suppliers outside the region, are less stimulated in accepting the stamped money. The percentage of income staying inside the area is therefore higher than before. Hence the demurrage provokes a decrease of “imports”, favoring the local production, and letting the equilibrium income to increase further more.

Looking at the formula we see:

$$Y = c_0 + c_1^{tot} Y - c_1^{tot} T + I + G + X - M$$

Where X denotes the exports and M the imports. Reducing the value of M the demand increases, and so the equilibrium Income.

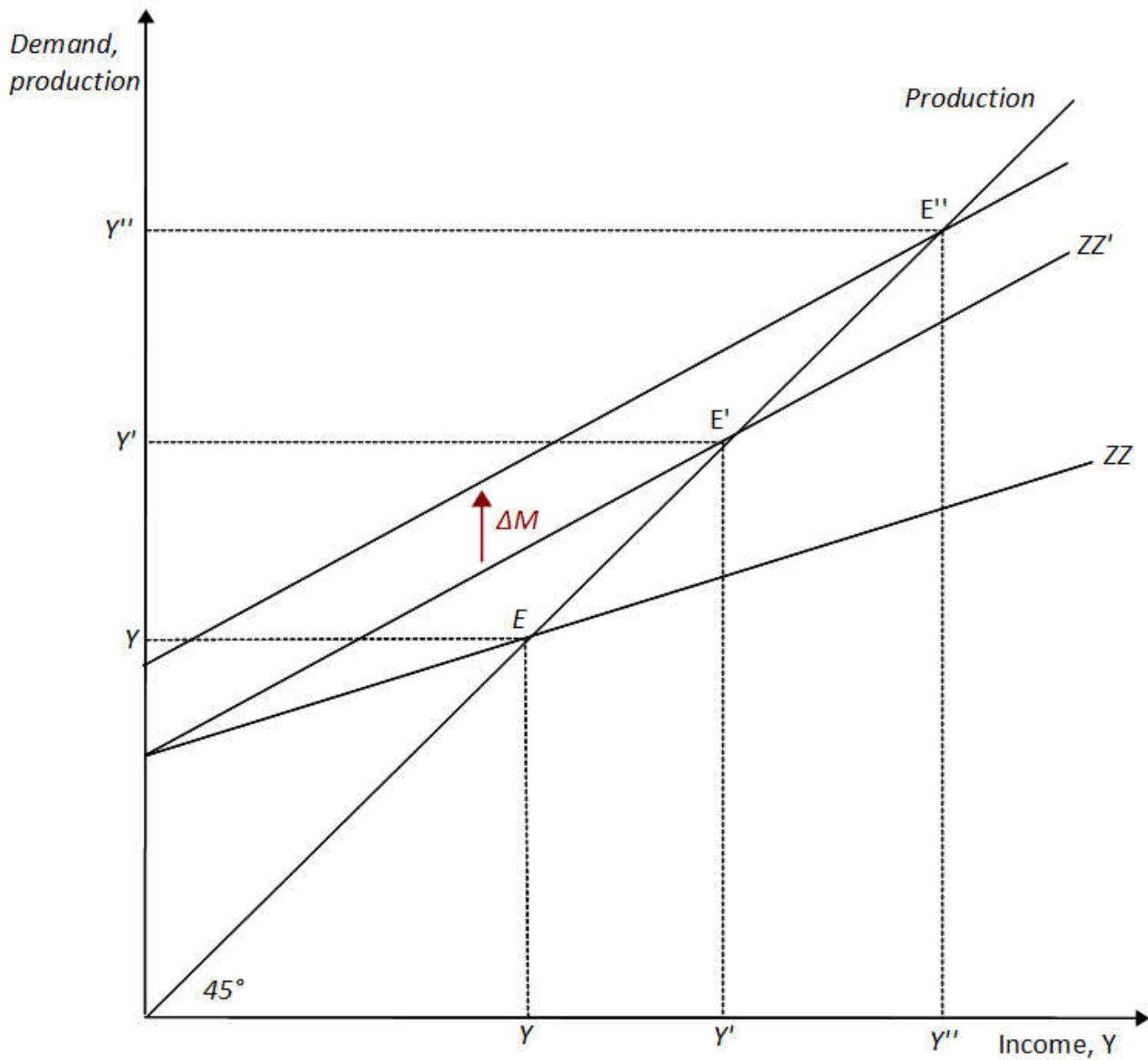


Figure 3: The new equilibrium when considering imports and exports: from E' to E''

The total effect of the increase in the marginal propensity to consumption and of the boost in the local production can explain from a theoretical perspective what we are going to see in the case study of Schwanenkirchen town.

4. The Miracle of Schwanenkirchen

The first application in the history of the stamped currency is the so called “Miracle of Schwanenkirchen”. In the 30’s Schwanenkirchen was a little town of the Bavaria Region of 500 people, where the first issue of a demurrage currency happened in 1931. In those years the most important economic resource of the city was the coal mine owned by Herr Hebecker. Due to the Great Depression, the mine had to shut down in 1929, ruining the whole economy of the small town. Two years later, Herr Hebecker succeeded in obtaining a loan of 40.000 German Marks, which he decided to invest in a particular way. Indeed, he managed not to pay his employees with the money he acquired, but he put them aside in a fund in order to issue a demurrage currency, named Wara. The miners accepted to receive their entire wage in this stamped currency, since almost any business activity in town agreed to be paid with the Wara. In case someone wanted to convert his Waras, he could have gone to the mine and exchange the stamped currency with coal, that later he could have sold in the national market. The 1% monthly tax bearing on the owner of the currency increased deeply the velocity of circulation of the money in the town, since no one, at the end of the month, wanted to hold Waras due to the 1% tax.

Few months later the local economy was truly recovering: the German newspapers were all talking about what they called “The Miracle of Schwanenkirchen”. The Wara system started to be implemented also in other parts of Germany: several banks opened accounts in which the stamped currency could have been deposited, but the German authorities opposed strongly to the system, believing that in the short run it would have caused a hyperinflation, worsening furthermore the crisis. It is estimated that in two years circulated 20000 Waras, and more than two million people used them.

What can we see from an economical perspective in this case? We can notice that after the shutdown of the coal firm there were two principal negative effects: a high rate of unemployment and a lack of liquidity. If Herr Hebecker had paid his employees with the Marks he received from the bank, the reaction of the workers would have caused just an initial increase in consumption followed by a high rate of saving. Furthermore the money spent by the workers could have left the town, preventing the restart of the local economy. Instead, The Wara forced the consumers to spend cyclically their incomes, working on the marginal propensity to consumption as we said before, avoiding a flight of capital. As a result, the town’s economy was able to recover from the crisis.

5. How to manage the reconversion issue

In this part we will focus on how the stamped money system can be managed once it is issued by a public authority in a region. We start from these assumptions:

- The issuing authority puts aside a fund of national currency equal in value to the quantity of stamped currency issued.
- The issuing authority gains from the allowance of the fund an interest equal to the real interest rate.
- When an economic agent reconverts a sum of stamped currency into the national currency he pays a fee higher than the tax on liquidity t .
- The issuing authority gains periodically the amount of the tax on liquidity.

The problems rising from a situation in which a demurrage circulates are basically funded on consumers' trust. Indeed we could have a hypothetical situation in which, right after the issue of the stamped currency, all the citizens run to the office to reconvert the demurrage into the national currency. Moreover, we can encounter problems also when a little amount of stamped money has to be reconverted: when the conversion takes place some of the stamped currency exits the market. Therefore the monetary base changes and so the process through which the issuing authority wanted to achieve its objectives can be biased, reducing the control power. Through an example, we will see the two types of policy the public authority can implement in order to manage this situation.

The first day of the year the new currency named Stampfoscare is issued in Venice substituting part of the public wages; the exchange rate between euro and Stampfoscare is 1:1, and the quantity issued is 1000. The 1000 Euros that the town hall saves due to the substitution of wages are put aside as a guarantee fund at the San Marco Bank, yielding a real interest of 3% per year, through monthly coupons. The liquidity tax amounts to 2%, and the fee for converting the stamped currency into the national one is 5%. If the fund is not managed and the issuing corporation only plans the issuing phase, citizens can convert how much money they want; therefore the monetary base varies, leading to the problematic situation we discussed before. If instead the public authority wants to leave the monetary base unchanged, it can set limits to reconversion; suppose for example that in the first month of circulation of the currency the reconversion is forbidden. Due to this fact the issuing institution, on the first of February, gains $0.0025 \cdot 1000 = 2.5$ Euros from the interest yield by the fund put aside in the San Marco Bank; then another 2 Euros are gained from the payment of the monthly tax on liquidity: in total the authority gains 4.5 Euros. Mister Rossi wants to convert some of his stamped currency: how much can he convert in order to keep the monetary based unchanged? 4.73 StampFoscari. Indeed in this way he gets 4.5 Euros back (we need to consider the tax on reconversion), that are withdrawn from the fund. In this way the authority can issue back the 4.5 StampFoscari, which are backed by the 4.5 Euros gained during the month of January. In this way the quantity in circulation is still 1000 StampFoscari, and the quantity in the fund still 1000 Euros.

The second policy the authority can implement is the one that allows for the public institution to actively manage the inflation through the reissuing of the stamped currency. Indeed, no limits for the conversion process are set: in this situation Mr. Rossi could have changed 100 StampFoscari. In this way, the quantity of stamped currency would have been of 900, and the amount in the fund would have been 909.5 (4.5 Euros from January's gains, 5 Euros from the reconversion fee). So if the authority reissues the 100 StampFoscari that Mr. Rossi converted, it would create inflation: 1000 StampFoscari now can be converted for just 909.5 Euros. This is a powerful tool in the hands of the public authority: if the objectives in terms of velocity of

circulation were not reached with just the effect of the liquidity tax, a devaluation of the StampFoscari could be used.

6. The theories of Silvio Gesell

In the final chapter we are going to analyze Silvio Gesell's thought about the stamped currency. His position thoroughly differs from Fisher's one: indeed, the German author conceives the stamped currency not as a complement to the national currency, but as a complete substitute. This vision comes from an interesting remark that Gesell explains in his book, the "Natural Economic Order"³ about the nature of money. Usually a currency carries out three functions: unit of account, medium of exchange and store of value. It is this last point what Gesell criticizes most: indeed, the fact that a currency is a reserve of value allows who holds money to demand a tribute just for the fact that the circulation of this currency can be delayed without any particular cost. Money is a good that does not deteriorate; so the owner of the money has a market power on who instead holds a good that deteriorates.

Moreover Gesell strongly criticizes the fact that money produces money: when someone lends a loan he has the right to ask an interest payment, getting richer just because he was the owner of the money. Therefore the currency should lose this peculiarity, simply performing what it was created for: "*Money is a just medium of exchange*" (Gesell, 1958, Volume III, Chapter 13).

The right to gain an interest looks like a tax on the exchange, because it allows the owner of the money to interrupt the buying and the selling; by delaying or cancelling the purchase of a good, the holder of the currency does not suffer any kind of damage linked to the worsening of his capital, while the producer of the good is affected by the non durability of his capital. Therefore we can understand why Silvio Gesell proposed the tax on liquidity: as we said before, hoarding a stamped currency is costly, and so the demurrage could bring the money back to what it was originally conceived for.

As a consequence, the interest rate should tend to zero, due to the fact that the money, becoming a non durable good, cannot pretend a high interest in order to be put in the market. Analyzing this last statement from a critical point of view, in the next paragraph we will try to enrich the general equilibrium models by fully replacing the national currency with the stamped money.

³ The book was originally written in the 1906 and then translated officially in English in 1958

6.1 Theoretical Considerations

6.1.1 Effects on demand

The peculiarity of the stamped money is the liquidity tax: this therefore must be included into the money demand's equation; what does this cause? It shifts downwards the curve. The tax has a negative effect on the consumers' willingness of holding money; the higher is the tax, the bigger are the shifts in the demand. We assume for simplicity that the money demand L^d is linear:

$$L^d = kY - hi$$

Where

k is the sensitivity of the money demand with respect to the level of income

Y is the income

h is the sensitivity of the currency with respect to the interest rate

i is the interest rate

After the introduction of the tax on liquidity the equation becomes

$$L^d = L_0 + kY - hi - sL^d$$

Where s represents the percentage effect of tax on liquidity on the money demand. If we rearrange the equation we obtain:

$$(1 + s)L^d = L_0 + kY - hi$$

And so

$$L^d = \frac{L_0 + kY - hi}{(1 + s)}$$

$$\text{Where } \frac{\partial L^d}{\partial s} = -\frac{L^d}{(1 + s)} < 0 \quad 0 < s < 1$$

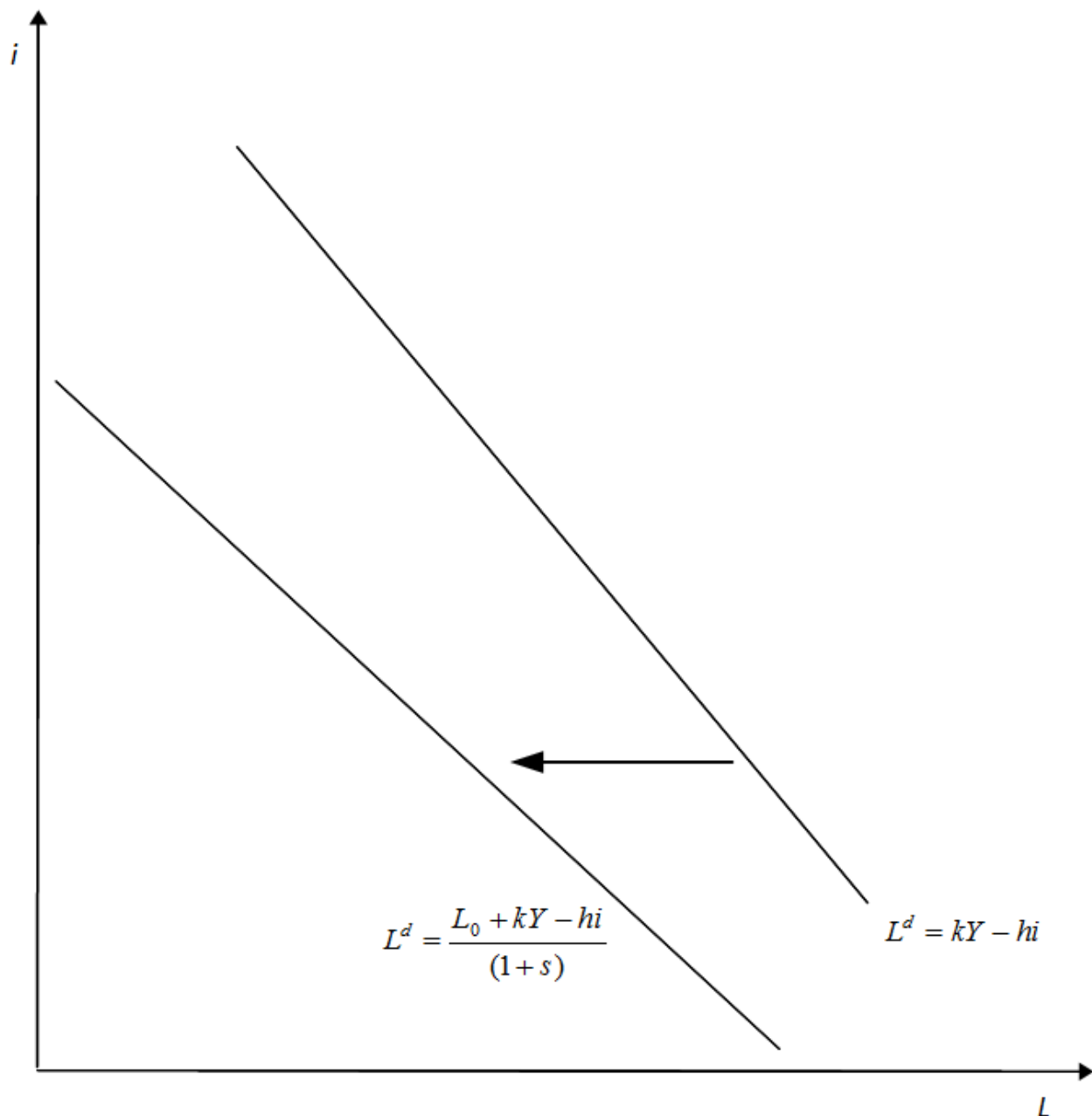


Figure 4: effects on money demand

We see that the curve shifts downwards, and it also changes slope: indeed the angular coefficient $-h$ after the introduction of the stamped money becomes $\frac{-h}{(1+s)}$

The demand curve seems to become more sensitive to variations in the interest rate: holding currency implies an additive cost to the opportunity cost i , due to the liquidity tax s .

6.1.2 Effects on supply

In order to analyze the effects of the introduction of the liquidity tax on the money supply, we need to assume some hypothesis on the behavior of the banks' deposits. We base our analysis on the "double deposit" system that has been theorized in recent proposals⁴. In this banking system every agent can choose between depositing his money in a simple current account or in a saving one. From the simple current account people can withdraw in any moment almost any amount of money, and the bank cannot use these deposits to finance loans or investments. The liquidity tax bears upon the owner of the account; we can so simply consider the money deposited in this account as a part of the money in circulation C_p .

On the opposite, people cannot withdraw from the saving deposit; when an economic agent opens this account she decides together with the bank when and how she will be able to withdraw her money. With these deposits banks can finance loans and investments, due to the fact that the tax bears upon the credit institutions and not upon the owner of the account; borrowing this money they transfer to someone else the cost of the tax on liquidity. Looking at the sources of the monetary base we see:

<i>Assets</i>	<i>Liabilities</i>
RU	R_1
H_0	R_2
H_p	C_p
	CS

RU is the foreign exchange owned by the bank

H_0 are the stocks owned by the bank

H_p are the loans to the banks

R_1 are the compulsory reserves

R_2 are the excessive reserves (kept by the banks out of prevention)

C_p is the money in circulation

CS is the corporation stock that we consider, for simplicity, equal to zero

⁴ For further informations, see Blanc (1998, pp.469-483)

The monetary base equation is defined as:

$$BM = [RU + H_0 + (H_p - R_2)]$$

We then use the Keynesian equation for the money supply

$$M_1 = \left(\frac{1 + \alpha}{\alpha + \beta} \right) BM$$

The equation expressing the relationship between money supply and monetary base becomes

$$M_1 = \frac{1 + \alpha}{\alpha + \beta} [RU + H_0 + (H_p - R_2)]$$

Considering the relationship between the money in circulation and the deposits (α), the system of double deposits provokes:

- An annulment of the excessive reserves: banks, unable to lend the money deposited in the simple current accounts, always have the necessary liquidity to face the immediate demand for liquidity; we can therefore hypothesize $R_2 = 0$ where $R = R_1 + R_2$
- A reduction in the ratio between reserves and deposits β : considering the level of the deposits constant, the reduction of the total level of reserves R causes the decrease of $\frac{R}{D}$, therefore lowering β .

The total effect is an increase in the monetary base value and so an increase in the ratio $\left(\frac{1 + \alpha}{\alpha + \beta} \right)$.

The result therefore is an increase in the money supply $M_1 = \frac{1 + \alpha}{\alpha + \beta} [RU + H_0 + (H_p - R_2)]$

That, expressed in real terms, becomes $\frac{M_1}{P} = \frac{m}{P} BM$

Graphically it can be interpreted as a shift to the right of the supply curve:

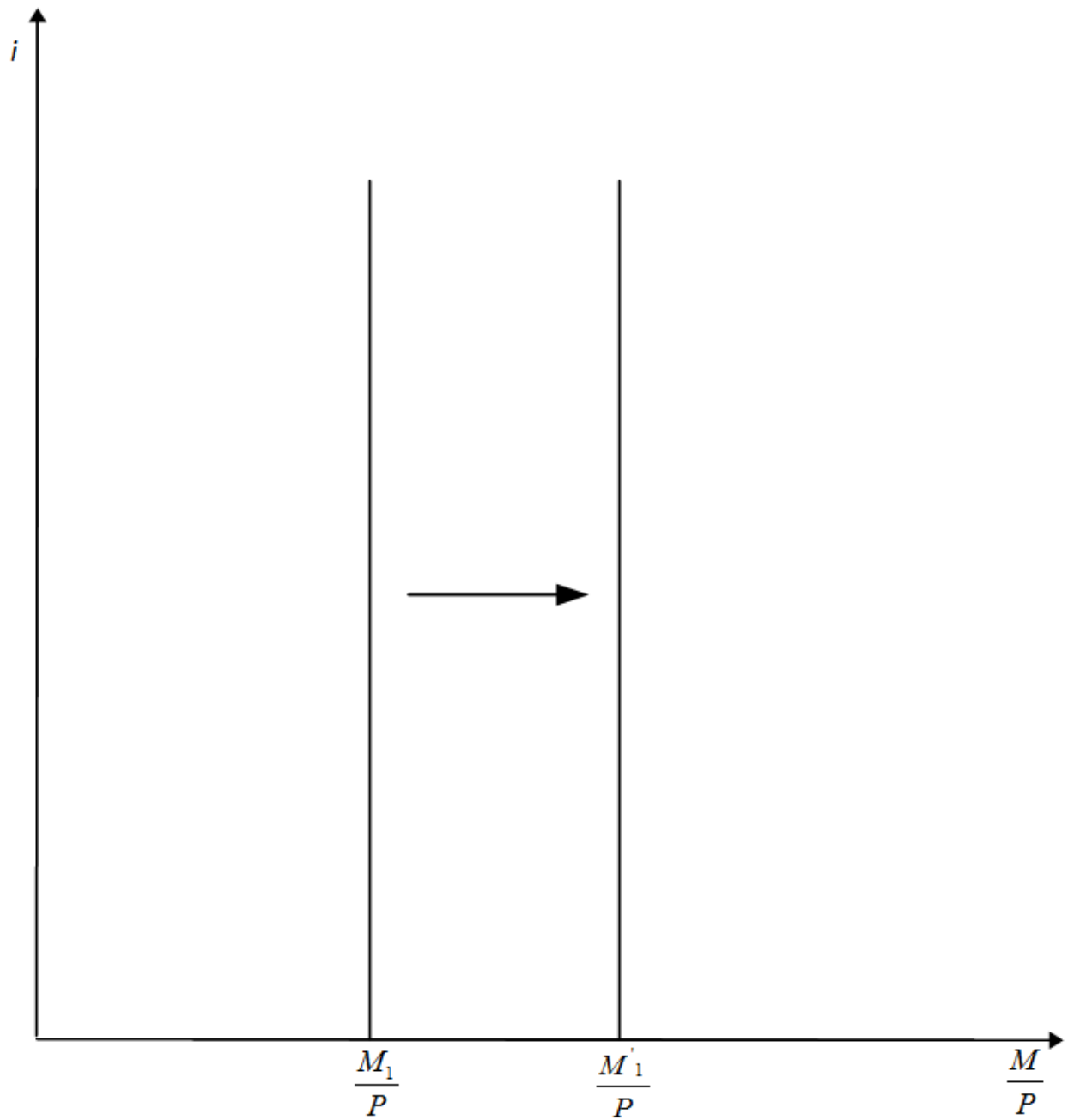


Figure 5: effects on money supply

6.1.3 Total effect

The total effect is a shift in the money market equilibrium; with the introduction of the tax on liquidity the supply of money expressed in real terms increases, while the equilibrium interest rate i^* decreases moving closer and closer to 0.

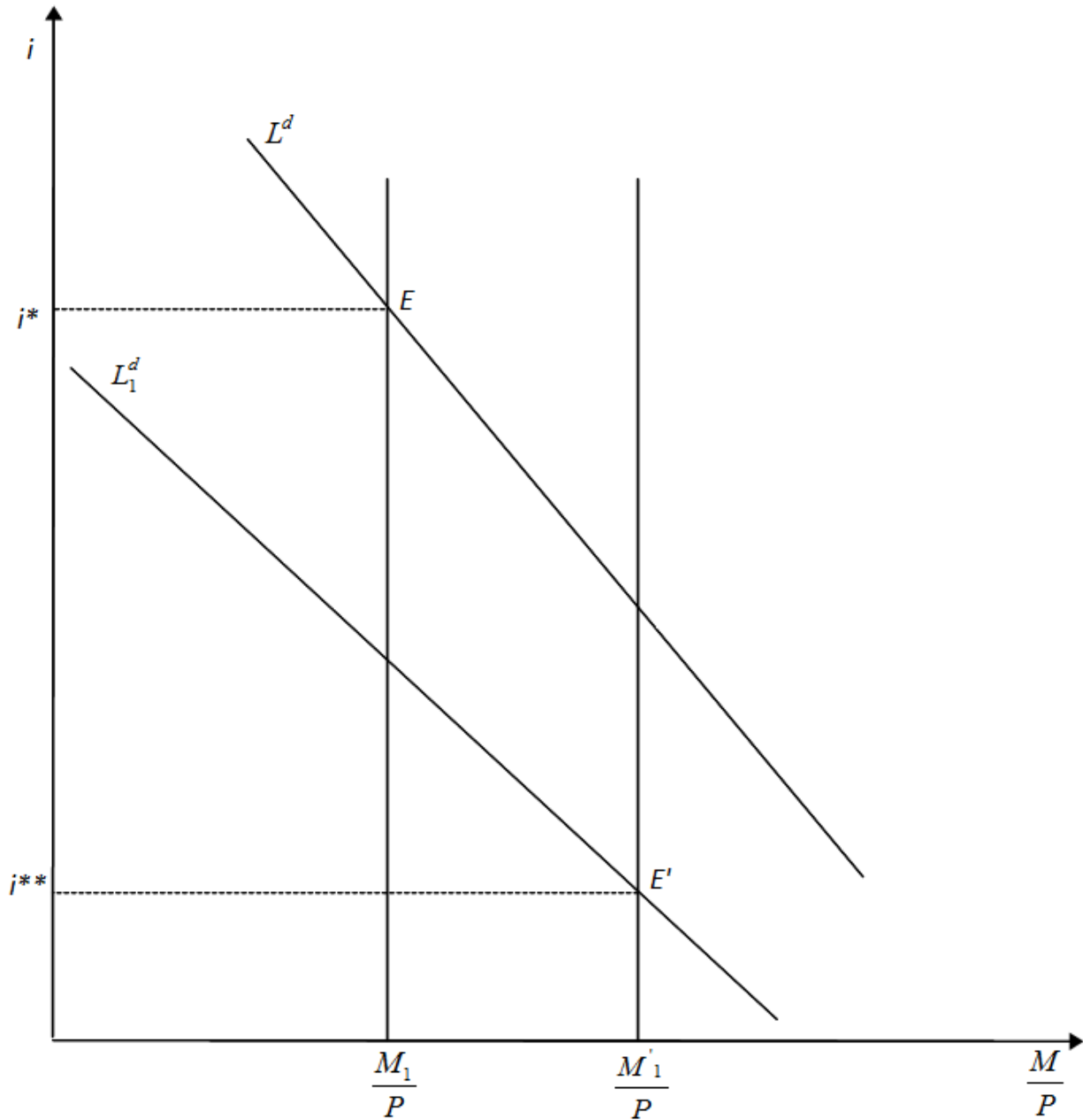


Figure 6: the total effect: the equilibrium shifts from E to E'

In this way we can think that the thesis of the German author about an interest rate approaching the 0 in a system based on a stamped currency are potentially confirmed from a theoretical point of view.

Therefore in conclusion, we can observe the movements in the IS/LM model. From our previous analysis we can state that the LM curve shifts to the right, due to the effects on the money demand and supply. On the contrary to what we saw analyzing the hypothesis of Fisher, the marginal propensity to consumption does not change: the system of the double deposits allows the citizens to keep their consumption choices unchanged. Indeed they can forecast their monthly expenditure and therefore deposit the excessive currency in the saving account, transferring the burden of paying the tax on liquidity to someone else. In this way the equilibrium in the market of goods remains unchanged, therefore preventing a movement in the IS curve. Hence the effect on the total equilibrium underlines the decrease in the interest rate and an increase in the production level Y^* .

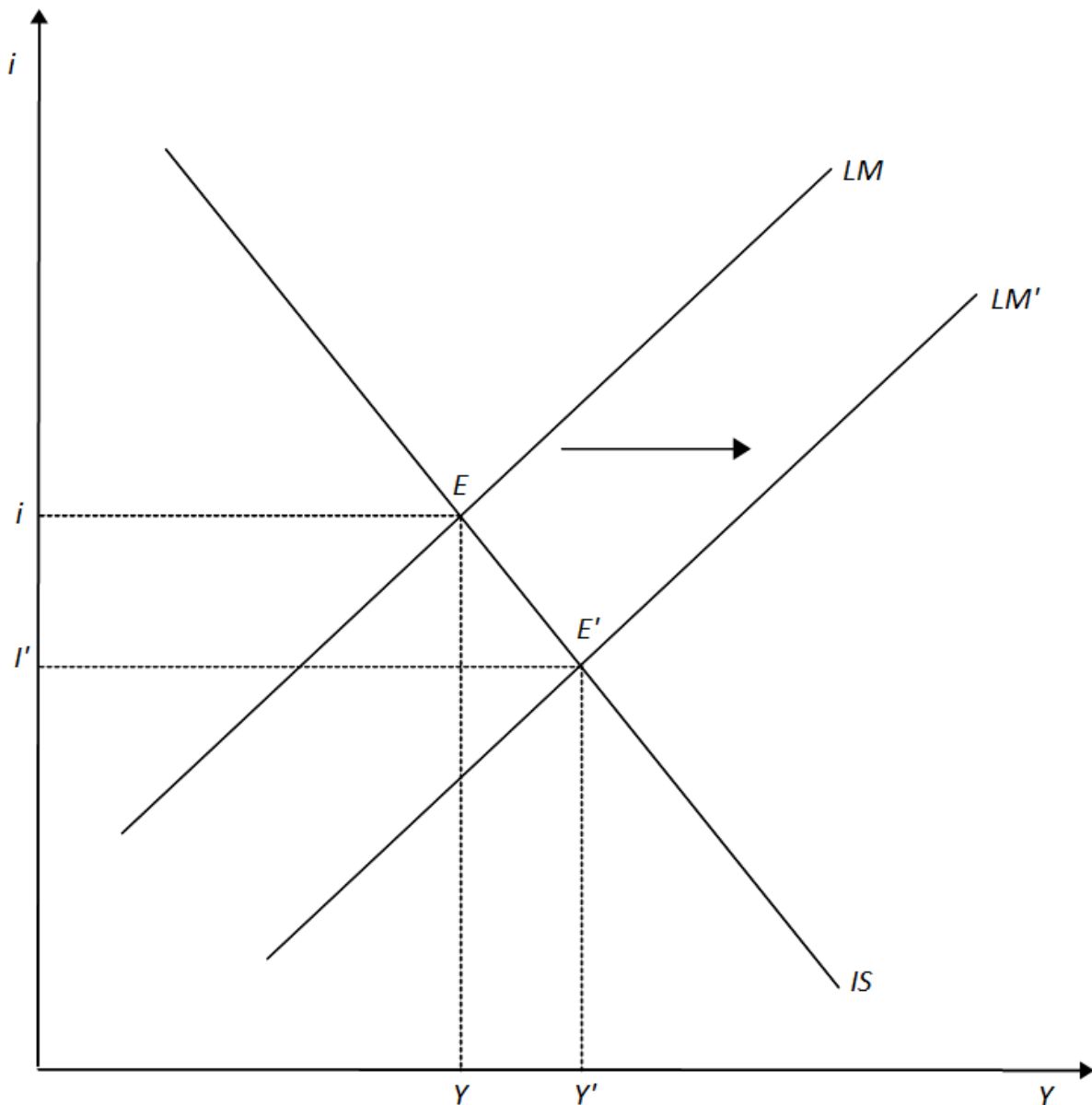


Figure 7: The shift in the LM curve changes the equilibrium from E to E'

7. Conclusion

The models we have analyzed in this short paper are to be considered a beginning of a deeper study. More modern models regarding the behavior of the money market should be handled and modified in a similar way to what we have done, in order to get closer and closer to the real effects a stamped currency causes after its introduction. Moreover, trying to give theoretical relevance and validity to this alternative solution is useful because it can help the development and implementation of local systems based on the demurrage, and maybe can lead the public authorities to consider this alternative view as a potential tool to face problematic situations like the one we are going through in these years.

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