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Is Local Currency An Effective Method for Transfer Payments in The South Korean Economy?

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ABSTRACT

This paper explores the impact and effectiveness of the local currency as a transfer payment tool in South Korea, especially during the COVID-19 pandemic. Introduced by the Korean government as an alternative to national currency and cash transfer payments, local currency seeks to stimulate local economies through the reduction of offshore outflow of funds. The study uses the game theory and Nash equilibrium concept to demonstrate that the use of local currencies in areas outside Greater Seoul is a dominant strategy in terms of welfare improvement. The multiplier effect is also applied to compare cash transfers with local currency transfers and in-kind transfers. The result that can be seen is that local currency transfer has a higher net local economic effect and in-kind transfer only benefits under certain conditions. This paper, therefore, concludes that local currency transfers are more viable tools for local economic revitalisation in support of small businesses and the alleviation of negative impacts brought about by offshore consumption. It also points to the strategic communication between local governments to maximise the benefits accruable from the local currency and reduce inefficiencies.

Introduction

When a local economy thrives, residents have access to improved opportunities – for education, skills, employment, social connections and health (PeoplesHealthTrust, 2022). If the outflow of regional income becomes too high, it reduces the size of the income distributed locally and acts as a hindrance to the virtuous cycle of the local economy (Research Institute for Gangwon, 2020). This paper will consider the specific example of flow of regional income from a small region within South Korea to Greater Seoul (analogous to Greater London). In South Korea, this phenomenon was even more severe during the COVID-19 pandemic due to the increase in online shopping (The e-business Studies, 2020). In 2020, as a response, the Korean government implemented a local currency policy, which is a form of money other than the national currency, set up and managed regionally within a country (Fleming, n.d.). This was done in two ways: a replacement of national currency and an alternative means of providing transfer payments instead of cash. As the policy started to be used as a political tool, it drew even higher attention from the public. Much research has since been conducted to assess the economic effect of introducing local currency.

Until now, research on local currency has been focussed on the first function (a replacement of national currency), but recently, the second function was newly trialed during the pandemic. Unlike the first function, the nature of transfer payments being provided by the government requires no consideration for incentive of the public by providing discounted local currency compared to national currency.

Therefore, this paper will look at the function of local currency as transfer payments, which is a payment of money for which there are no goods or services exchanged, usually from the government (H.R. 748, CARES Act). I will show that there is a logical justification to support the use of local currency as a means of transfer payments, when concentrating the effect on small local regions, by using game theory analysis. Then, I will employ the multiplier effect to quantify the local economic effect of transfer payments. Since the local currency transfer is an alternative to cash transfer and in-kind transfer, as a transfer of goods or services (IRS, n.d.), is often compared with cash transfer,

this paper will compare these three methods in the Findings and Discussion section. The significance of this research and recommendations for future policymakers such as the importance of communication between local government will be laid out in the Conclusion and Evaluation.

Literature Review

Local currency is a community currency where the community is a geographically bounded area. Community currencies are tied to a specific, demarcated and limited community. Community currencies are a subset of complementary currencies which are designed to sit alongside mainstream money to address objectives that the conventional money system cannot. There are two types of local currency: labour exchange type local currency (LLC) and gift certificate of local currency (GLC) (Kim, 2019); the Korean government introduced the latter. Since LLC is likely to be successful in less populated or geographically isolated areas like Ithaca, United States and Toronto, Canada (Kim, Wu and Lough, 2016) which is not in the case in Korea, the focus of this paper is GLC.

GLC is a form of gift certificates that the head of a local government issues and sells certificates to the public by stating certificates have a specified value and can only be used at the local government's affiliated shops (Ministry of the Interior, 2020). The aim of paying a stimulus check in the form of local currency (GLC) instead of cash transfer or in-kind transfer is the vitalisation of the local economy by promoting consumption in the region and supporting small business owners. Such type of issuance of local currency as a means of transfer payments is called ‘policy issuance’, which is paying cash-based welfare benefits in local currency. Another type is called ‘discount issuance’, which involves local government selling the currency at a discounted price to promote the distribution of local currency. The major debate regarding GLC has been whether it is a suitable alternative to legal tender, which is a role of discount-issued GLC (IlyoNews, 2021). Prominent contention around this subject is that discount issuance raises the question of sustainability, as it requires the government to subsidise the difference of the amount discounted to provide incentives to consumers. Therefore, in accordance with the flow in academia, this paper will focus on policy-issued GLC.

As the scale of government issuing of GLCs surged from 2 trillion KRW in 2019 to 20 trillion KRW in 2021 (Ministry of the Interior, 2022), GLC as a tool of controlling the offshore outflows from regions received high attention. Offshore outflow of local funds means that funds raised by production and financial activities are not re-injected into regional economic activities but are temporarily or permanently discharged to other regions (Daejeon Development Institute, 2003).The importance of this role of preventing the withdrawal of income generated in the local region to other areas emerged especially in local regions where inflow of money is small; in these areas, the increase in outflow led to a more serious decrease in consumption and a production. Lafuente-Sampietro (2021) analysed the effect of inflow and outflow on consumption in the local economy by considering convertible local currencies. This paper also modelled the income circulation between citizens and analysed the total effect on the spending of local currency.

However, in the case of South Korea, the inflow into the local regions is relatively small, while the outflow of consumption from regions to Greater Seoul is significant. According to Bank of Korea (2023), Gross Regional Domestic Product (GRDP) is much greater than Growth Regional Income (GRI) in the case of regions, and net income flow is positive only in a few regions, such as Greater Seoul. This trend has intensified since COVID-19, according to Bank of Korea (2021); the rate of offshore consumption before and after COVID-19 increased by more than 50% outside of Greater Seoul, compared to only 5% in Greater Seoul. Over time, local money tends to flow unilaterally to Greater Seoul. Hence, inflow into the other regions of South Korea will be considered as negligible in later modelling. Additionally, this circumstance leads to the conclusion that criticism against local currency based on the prisoner’s dilemma, a common rationale for the criticism, is invalid when considering the effect on the region itself. The argument says the introduction of local currency has the characteristics of a zero-sum game (KIPF, 2020). However, the model does not apply to the regional circumstance in South Korea due to the nature of the Korean economy where

inflow into the region is too small to be considered. Therefore, a new model is required in analysis using the prisoner's dilemma.

Recent developments in academia focus on using the multiplier effect in the research on local currency (Lafuente-Sampietro, 2021). The multiplier effect can be used to analyse the impact on local economy quantitatively. The faster the local currency circulates within the region, the greater the multiplier effect. The greater the multiplier effect, the greater the contribution of local currency to the local circulation economy (Choi and Lee, 2021). This concept will be used later in this paper modelling the local currency multiplier.

Game Theory Model for Local Currency

The Importance of Controlling Outflow of Consumption

While transfer payments served a role in boosting the Korean economy, one problem occurred: the concentration of funds in large cities. When the Korean government decided to provide stimulus checks on 30th March 2020, local economies were already suffering great damage due to especially high offshore outflow from local regions to Greater Seoul. The main factor of the increased outflow was the change in consumption patterns that became clear through the COVID-19 period (KDI, 2021a). The consumption rate in Greater Seoul increased as the act of purchasing goods offline shifted to online consumption during the period. The problem was intensified because headquarters of companies providing online payment services are gathered in Seoul and Gyeonggi Province. This accelerated the outflow of money from local regions, and it went to Greater Seoul.

Although the inflow and outflow of funds is a natural phenomenon in the market economy system, if funds raised in the region continue to flow out due to structural factors, the phenomenon of 'the rich get richer and the poor get poorer' between regions may be fixed, deepening the poverty problem in underdeveloped areas (Daejeon Development Institute, 2003). Recognising the importance of controlling the outflow of consumption, one local government introduced local currency transfers, as an alternative to cash transfers, to provide a means for the government to regulate where the transfers could be spent. This aspect of local currency transfer drew attention from other local governments. Other cities and provinces began to introduce local currency quickly, and by October 2021, 17 cities and provinces had issued 190 local currencies (KRILA, 2021). As most of the people received stimulus checks in local currency, their understanding of local currency also increased. Local currency transfer was in the limelight amongst all the types of transfer payments the Korean government adopted.

Not every politician and organisation approved of the introduction of local currency, however. There was also an argument against local currency based on the concept of inflow and outflow and the prisoner's dilemma.

Set-Up

I considered two areas: R (the region) and G (Greater Seoul) and simplified the consumption structure as residents spending either in their area or the other.

Let r be local spending by residents of R and let g be local spending by residents of G. Let o be outflow of consumption from R to G and i be inflow of consumption to R from G.

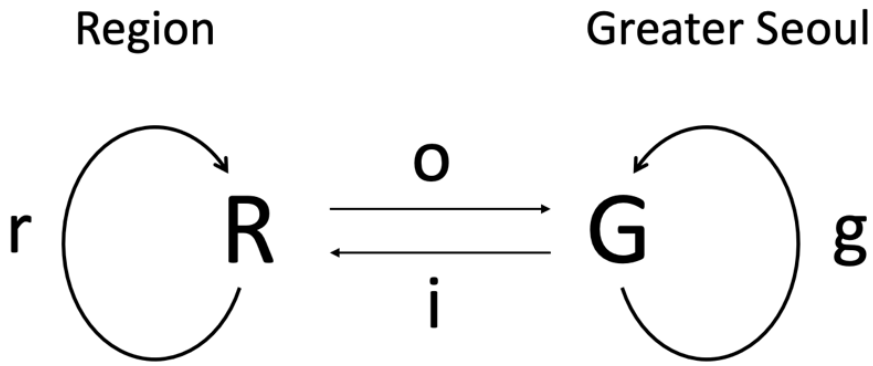

Figure 1.

Welfare is the total sale that an area earns after one transaction. This model is designed to analyse the effect after a single transaction in order to maintain the simplicity in the construction of the model. The welfare of area R is calculated by the sum of local spending and inflow which is given by $r + i$, as shown in the Figure 1. In the same way, the welfare of G is $g + o$.

Introduction of Local Currency

Case 1: Unilateral Introduction of Local Currency

I will assume that people have unlimited wants, and they will spend any money they receive. Then, if either G or R introduces local currency (for simplicity, I will choose area R), residents of R cannot consume with transfer payments in the area G. Therefore, o would be spent in area R instead. Meanwhile, R and G would remain the same, and inflow i from G to R would also be the same. The welfare of R would thus be given by $r + i + o$ and the welfare of G would be g. For the net welfare in each case, a cost, c, would be subtracted whenever the local currency is introduced. So the net welfare of R would be $r + i + o - c$.

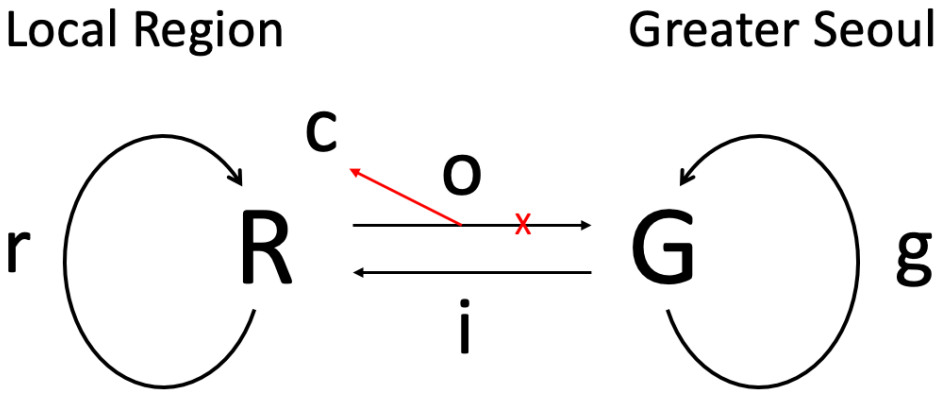

Figure 2.

By the parallel nature of this model, if G introduces local currency area but R does not, the welfare of G would be $g + i + o - c$ and in R it would be r.

Case 2: Bilateral Introduction of Local Currency

If both parties introduce local currency, the welfare of R would be $r + o - c$ and the welfare of G would be $g + i - c$.

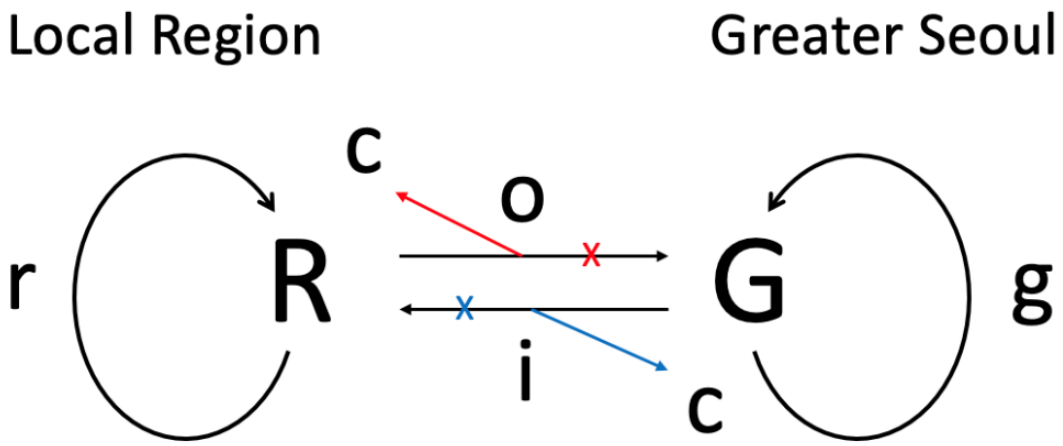

Figure 3.

Solution

Payoff Matrix

Let the strategy for R be classified as nl and l, where nl is not introducing local currency and l is introducing local currency. Let the strategy for area G be classified in the same way. The payoff matrix for the welfare is the following:

Table 1. Payoff matrix with the introduction of local currency

R \ G	nl	l
nl	$(r + i, g + o)$	$(r, g + i + o - c)$
l	$(r + i + o - c, g)$	$(r + o - c, g + i - c)$

Concept of Nash Equilibrium

To find an equilibrium for this model, we will use the Nash Equilibrium. In game theory, the Nash Equilibrium is a situation in which a player will continue with their chosen strategy, having no incentive to deviate from it, after taking into consideration the opponent's strategy (Colman, 2009). The Nash Equilibrium is often compared to a 'dominant strategy', another type of strategy within game theory. One kind of strategic dominance relevant to this model is a 'strictly dominant strategy', which always provides greater utility to the player, no matter the strategy of the other player (Lope Gallego, 2017).

Most papers dealing with the Prisoner's Dilemma assume that the local government would introduce local currency in the local economy only if the expected benefit from the inflow is greater than the cost of introducing the

local currency. For this reason, assuming that both i and o are greater than c, if local currency is introduced in adjacent areas, introducing local currency in this area becomes a strictly dominant strategy. If both players have a strictly dominant strategy, the game has only one unique Nash equilibrium, referred to as a "dominant strategy equilibrium" (Varian, 2019), which is both areas issuing local currency in this case. However, that Nash equilibrium is not necessarily "efficient", meaning that there may be non-equilibrium outcomes of the game that would be better for both players (Varian, 1978). Eventually, both areas end up introducing local currency, even though in fact both using local currency result in lower welfare because of the issuance cost, hence the prisoner's dilemma.

Application to the Korean Economy

The preceding argument regarding the prisoner's dilemma is true if only considered two areas as a whole. However, the main difference between the generic economy and the Korean economy is whether the assumption of letting i and o be greater than c can be maintained. According to Yoon (2022), o is likely to be greater than c in the Korean economy: "issuance cost is not that significant compared to the amount of deterred offshore outflow and increased local consumption in small businesses". On the other hand, inflow of consumption from Greater Seoul to the region, i, is almost negligible. It is more logical to regard i as 0 rather than considering i greater than c, as Hwang stated (2023) that the consumption inflow to the region is much weaker than the offshore outflow to Greater Seoul. Additionally, the significance of the policy is to distribute funds concentrated in the Greater Seoul to small cities and provinces. It is necessary to analyse the policy effect by focusing only on the region, not the whole country. Considering these two aspects, the payoff matrix can be amended as follows:

Table 2. Payoff matrix with the local currency in the context of the Korean economy

R \ G	nl	l
nl	$(r, g+o)$	$(r, g+o-c)$
l	$(r+o-c, g)$	$(r+o-c, g-c)$

Thus, introducing local currency is a dominant strategy for R and not introducing local currency becomes the dominant strategy for G. The resulting welfare for R (the region) becomes $r+o-c$ which is greater than r, which would be the welfare from not introducing local currency (since I assumed $o > c$). Since the purpose was to boost the economy in the region, the local currency is thus proved to be effective when focusing on the region. It is beneficial for area R, so there is no prisoner's dilemma because area R reached an optimal outcome in the equilibrium, which does not happen in the prisoner's dilemma equilibrium. Hence, there is a logical basis for advocating the use of local currency as transfer payments.

Measuring The Effect of Three Transfer Methods

Introduction of Multiplier Effect Concept to Local Economy

Although cash transfer, local currency transfer and in-kind transfer all seem to have the same effect at first glance, the extent to which they affect the local economy after the circulation in the local economy might vary between each method. The goal for local government is to find the method that boosts the local economy the most when spending a given amount of money. In the national economy, if the government does the spending, we often consider the final increase in national income, which is calculated based on the multiplier effect.

Generic Version

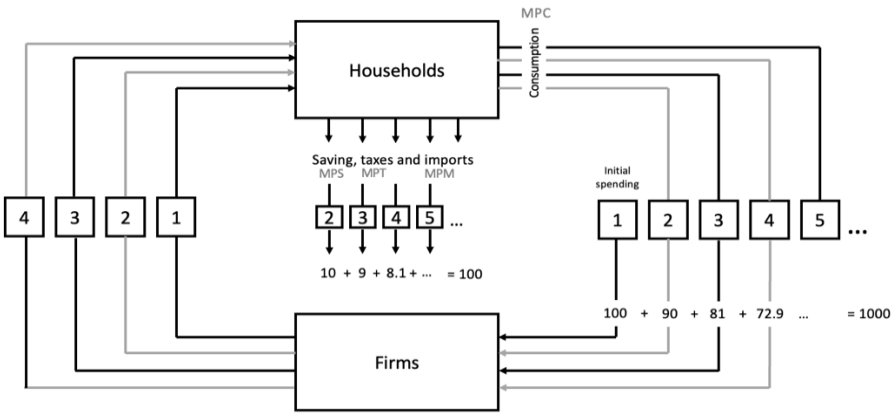

Figure 4. (Anderton, 2015)

For example, consider the situation where the government spends £100 million to build a new road, as shown in the Figure 4 as initial spending. The government pays contractors (firms), and contractors would pay workers to build the road. So, this £100 million would be an increase in national income. Workers would spend some ratio, which we call Marginal Propensity to Consume (MPC), of the money they are given. The rest, such as taxes, savings, or imports, would be the withdrawals. The ratios of each of these are called MPT, MPS and MPM respectively. As an example, the Figure 4 shows effect when Marginal Propensity to Withdraw (=MPT+MPS+MPM) is 0.1. The money workers spend flows round the economy and adds smaller and smaller amounts to the national income. Eventually, the initial £100 million government spending leads to a final increase in national income of £1000 million. This is the multiplier effect, by a multiplier of 10. For the general case, using W instead of £100 million, I get:

$$\text{Economic effect} = \mathrm{W} + \mathrm{MPC} \times \mathrm{W} + \mathrm{MPC}^2\mathrm{W} + \cdots = \frac{\mathrm{W}}{1 - \mathrm{MPC}}$$

Local Economy Version

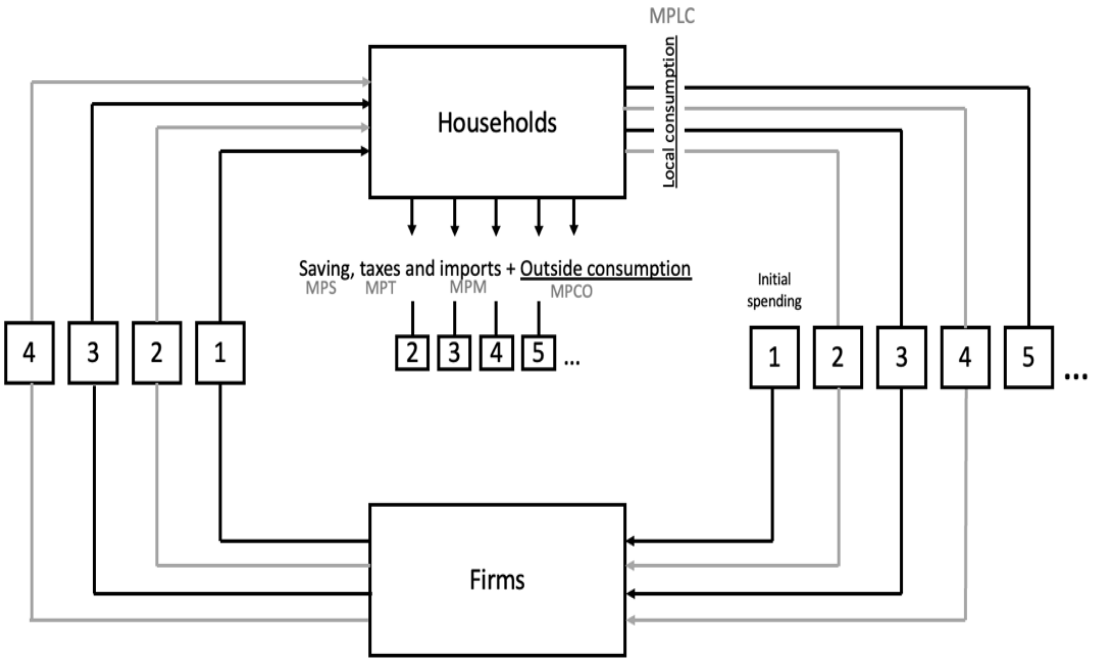

Figure 5.

Inspired by the calculation of the multiplier effect at the macroeconomic level, I will now apply the multiplier effect concept to the local economy. While the concept of MPT, MPS and MPM can be kept the same, Marginal Propensity to Consume (MPC) can be divided into Marginal Propensity to Locally Consume (MPLC) and Marginal Propensity to Consume Outside (MPCO).

Net Local Economic Effect of Three Transfer Methods

Since the emergence of local currency as a means of transfer payments was to replace cash transfer, I will compare the effect of cash transfer and local currency transfer by the following analysis of the multiplier effect. Carrying the same assumption from the section I.5, I let the inflow be 0 because the inflow of consumption into the regions is relatively small compared to the outflow of consumption to other regions such as Greater Seoul.

Cash Transfer

Derivation of the Formula:

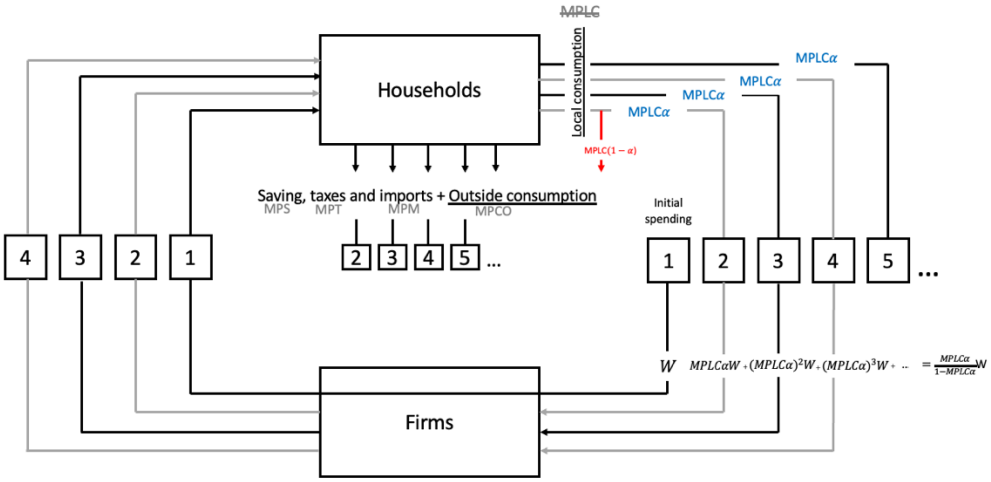

Figure 6.

Government paying cash as a transfer payment would be a windfall increase, which is shown as W. W goes straight to the households for transfer payments instead of going to the firm as it would in the generic version. Of this windfall, the amount spent in the local area is given by $MPLC \times W$.

However, not all the money spent in the local area stays in the local economy, which is shown as a red arrow in the Figure 6. For the money to stay in the local economy, not only should the consumption happen in the local economy but also people who receive the money should also belong to the local economy, meaning that local sellers should benefit from the local consumption. But it is led by the nature of economy that only a certain amount of consumption that takes place in the local economy stays there. The main reason is online purchases, which have become far more prevalent following the COVID-19 pandemic and now accounts for 48.3% of supermarket sales. Another reason is that many shops, especially supermarkets, where most of the windfall is consumed, are directly owned by big firms, namely franchise supermarkets. The money big firms receive will be a withdrawal from the local economy since they are usually located in Greater Seoul. That money would not be circulated in the local economy anymore even if the consumption occurred in the shops located in local areas.

Therefore, only a certain ratio of local consumption stays within the local economy. I let this proportion be α. Here, α is different from MPLC because while MPLC is a proportion of expenditure within the local economy, α is the proportion of money local sellers actually receive when the money is spent locally. The amount of transferred cash staying within the local economy after one transaction is given by $MPLC \times \alpha \times W$.

Following the same construct as the aforementioned macroeconomy multiplier, the multiplier model for the cash transfer would be a specific version of the model with MPC replaced with MPLCα.

Therefore, letting the net local economic effect of cash transfers be given by ε_{ct}, the formula would be

$$\varepsilon_{ct} = MPLC\alpha \times W + (MPLC\alpha)^2 \times W + (MPLC\alpha)^3 \times W + \cdots$$
$$= \frac{MPLC\alpha}{1 - MPLC\alpha} \times W$$

Since net local economic effect is defined as net local welfare and net welfare is calculated as benefit − cost, net local economic effect induced by the windfall increase is calculated by the sum of the increase in regional income after each transaction, minus administration costs associated with the transfers., which I will call C_{ct}

Therefore, the formula for the local economic effect of cash transfer is given by:

$$\varepsilon_{ct} = MPLC\alpha \times W + (MPLC\alpha)^2 \times W + (MPLC\alpha)^3 \times W + \cdots - C_{ct} = \frac{MPLC\alpha}{1 - MPLC\alpha} \times W - C_{ct}$$

Application to the Korean Economy:

a) MPLC of the Korean Economy

Bank of Korea (2023) reported that the average of 17 regions for offshore outflow consumption is 24.2%. Assuming that inflow consumption is negligible, I assumed that people spend 75.8% of their income within the region.

b) Cost of Cash Transfer

The cost of cash transfer amounts to around 18% of the paid amount, assuming that cash transfer payment has been made as a lump-sum (McGuire, 2021).

So, I set $MPLC = 0.758$ and $C = 0.18W$.

c) Finding the ratio **α**

According to KDI (2021b), people on average spend 70.3% of the windfall they are given on food shops, namely supermarkets. It is highly likely that expenditure on franchise supermarkets does not stay in the local economy even if they are located in the local area. For modelling purposes, I assumed that foods shops that are located in the area but not owned by big supermarket firms are owned by the local people. Another assumption is that expenditure on online supermarkets and franchise supermarkets are factors of withdrawal. In the model, I considered the fact that even expenditure in supermarkets owned by local people would lead to some withdrawal because 80% of the products are supplied by big firms (Yoo, 2023). In that case, what stays in the local economy is only the commission the owner gets from running the business. Therefore, the model would look like the following:

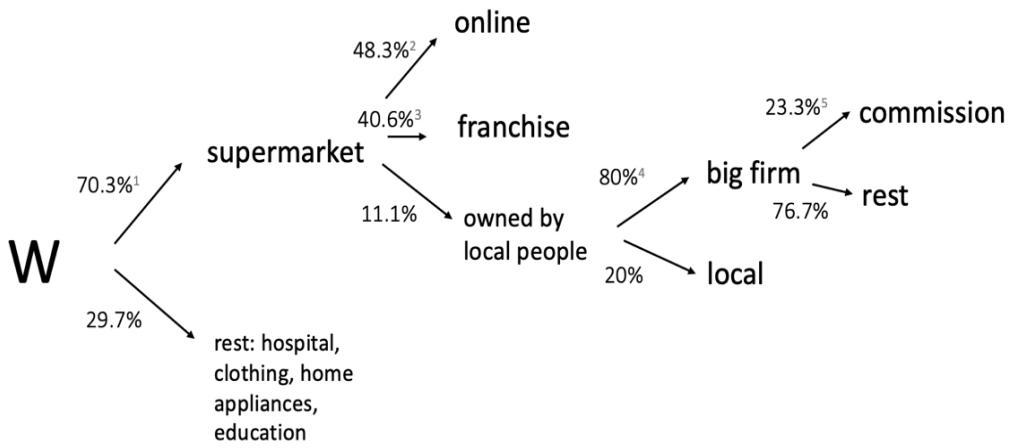

Figure 7.

Due to spatial constraints, the in-text citations are placed in the footnote.

$$\alpha = 0.703 \times 0.111 \times (0.2 + 0.8 \times 0.233) + 0.297 = 0.327152 \ldots \simeq 0.33$$

d) Substitution

Substituting the numbers into the formula gives:

$$\varepsilon_{ct} = \frac{MPLC\alpha}{1 - MPLC\alpha} \times W - C_{ct}$$
$$= \frac{0.758 \times 0.33}{1 - 0.758 \times 0.33} W - 0.18W$$
$$\simeq \mathbf{0.15W}$$

This means that when W amount of money is spent by the local government as cash transfer, only 15% of it stays in the local economy.

Local Currency Transfer

Derivation of the Formula:

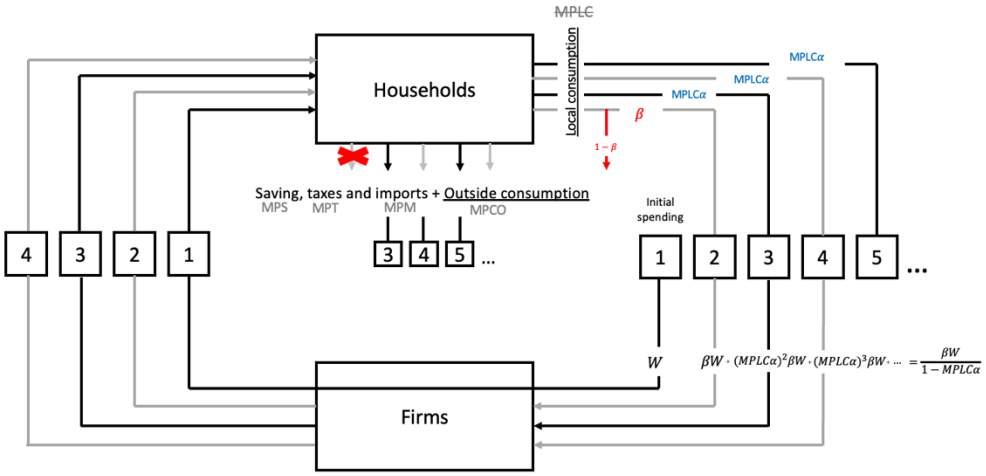

Figure 8.

Assuming that people have unlimited wants, they will spend all the money they received since, by its nature, saving is not an option for local currency. So, unlike the case of cash transfer, consumers have no choice but to spend all the transferred local currency in the local economy. It means that MPS, MPM, MPCO for the first round would all be 0, hence the red X in the Figure 8. Since transfer payments are being paid in the form of local currency, tax would have been already considered before the government paying them out. W amount would be the first consumption people who received the transfer payments made.

However, similar to the case of cash transfer, not all the consumption stays within the local economy because of withdrawal of consumed money to big firms. Ratio β is the proportion of the consumption staying within the local economy. Ratio β would be different from α because there are some restrictions where local currency can be spent. After the first transaction, money circulating in the local economy would be βW. Then, since local currency is entirely used, βW amount of money circulating in the local economy would be in the form of national currency.

Thereafter, the effect of the policy will continue as it does for cash transfer. Using the same construct as the aforementioned cash transfer multiplier, the final formula for the local currency transfer, with issuance cost C_{lc}, would be :

$$\varepsilon_{lc} = \beta W + MPLC\alpha\beta W + (MPLC\alpha)^2\beta W + \ldots - C_{lc} = \frac{\beta W}{1 - MPLC\alpha} - C_{lc}$$

Application to Korean Economy:

e) Cost of Local Currency Transfer

On average, the cost of local currency transfer amounts to around 30% of the face value (Seang, 2021). Therefore, we can say $C_{lc} = 0.3W$. *I* will use the same value for the MPLC (0.758) as the cash transfer model.

f) Finding the ratio **β**

Like I showed in the case of cash transfer, the usage of local currency highly affects to what extent the money spent as local currency stays in the local economy. β can be calculated in a similar way to α. In the report from Gyeonggido Assembly (2020), 29.4% of total spending was on restaurants, while 20.3% was spent on supermarkets. Approximately 50% of the total amount of local currency payments is concentrated in the top two industries, restaurants and supermarkets. High spending on restaurants and supermarkets may not necessarily equate to full spending within the local economy, since many of the ingredients used in restaurants and products sold in supermarket are from large firms located in Seoul. While the general structure is similar to the model of cash transfer, the fact that a high proportion is spent on restaurants is a key difference. Also, another difference is that consumers can only spend in an off-line, non-franchise supermarket. I assumed that most of the cost of ingredients for the restaurant stays in the local economy. And I assumed that any money not spent on restaurants or supermarkets (50%) was spent on the local economy, since the rest of the spending was mostly on private education institutions, hospitals, hairdressers etc., which usually constitutes spending within the local economy. The model would look like the following:

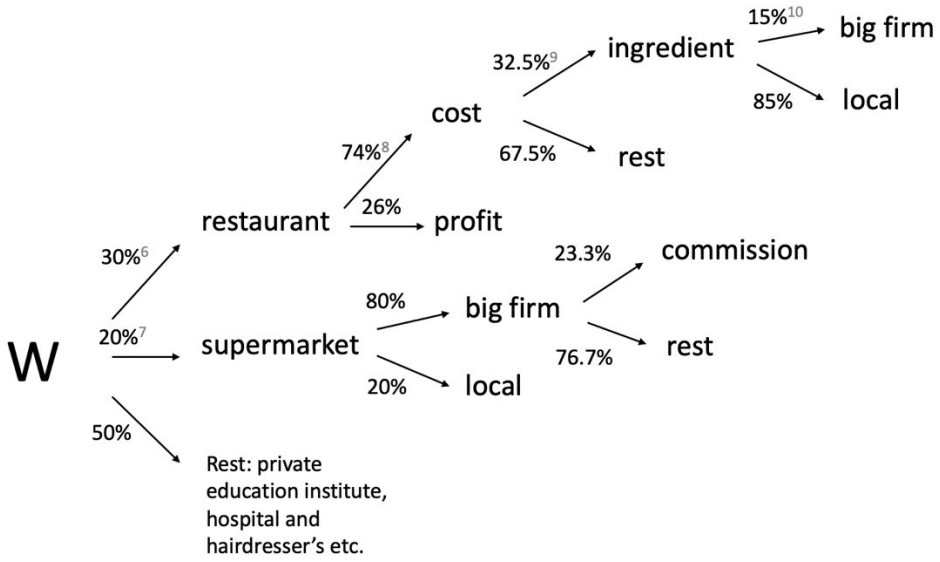

Figure 9.

Due to spatial constraints, the in-text citations are placed in the footnote.

I was able to calculate the value of β based on the model:

$$\beta = 0.5 + 0.2(0.2 + 0.8 \times 0.233) + 0.3\{0.26 + 0.74(0.675 + 0.325 \times 0.85)\}$$
$$\simeq 0.87$$

This means when W amount of local currency is paid, 0.87W remains in the local economy.

g) Substitution

Substituting MPLC = 0.758, the formula gives:

$$\varepsilon_{lc} = \frac{\beta W}{1 - MPLC\alpha} - C_{lc}$$
$$= \frac{0.87W}{1 - 0.758 \times 0.33} - 0.3W$$
$$\simeq \mathbf{0.86}\boldsymbol{W}$$

In-Kind Transfer

Some might argue that the opportunity cost of issuance and distribution cost of local currency is too high. They might argue that reducing the withdrawal as much as possible by using in-kind transfer is better. The concept of in-kind transfer is another form of transfer payments which is more extreme to the other end. One argument is that in-kind transfer is a better policy for the local economy because this method makes it possible for the government to control the effect on the local economy more directly. To evaluate this argument, this paper analysed the local economic effect of in-kind transfer using the similar concept of multiplier effect.

Derivation of the Formula:

h) Local economic effect of government buying local goods for in-kind transfer

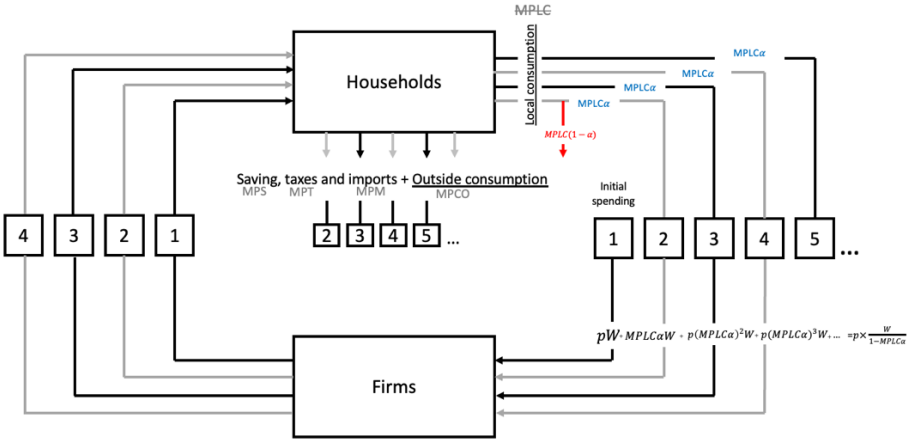

Figure 10.

Let p be the proportion of government purchasing goods from local area. Then, of the amount (W) the government spent to buy the goods for in-kind transfer, pW would be the money staying within the local economy, which I consider to be the initial transaction. Since this is circulated in the form of national currency, MPLCα amount of pW would be added to stay within the local economy after the second transaction, using the previous formula for the cash transfer section. These transactions would be repeated ad infinitum, so the local economic effect from this would be the following:

$$pW + pMPLC\alpha W + p(MPLC\alpha)^2W + \cdots$$
$$= p(W + MPLC\alpha W + (MPLC\alpha)^2W + \cdots)$$

i) Local economic effect of consumers spending the newly created budget

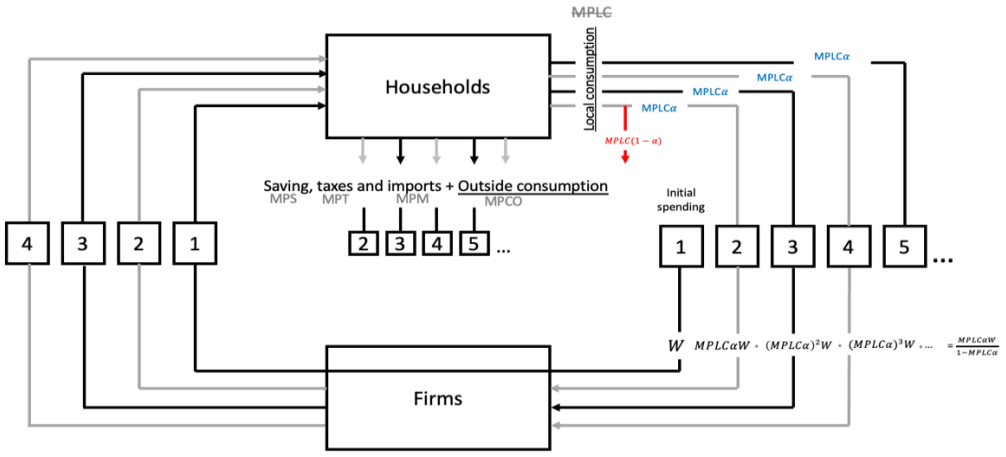

Figure 11.

Another aspect of in-kind transfer is that when consumers receive goods as in-kind transfer, consumers now can spend on other goods with the money they would otherwise have spent on those goods they received as in-kind transfer. In this case, MPLCW would be spent locally and MPLCαW would be the amount of money staying in the local economy after the first transaction. Hence the increase in regional income would be the following:

$$MPLC\alpha W + (MPLC\alpha)^2 W + \cdots$$

C_{ik} is the cost of procurement and logistics incurred from in-kind transfer. Therefore, the net local economic effect of in-kind transfer (ε_{ik}) is calculated as below:

$$\varepsilon_{ik} = p(W + MPLC\alpha \times W + (MPLC\alpha)^2 \times W + \cdots) + (MPLC\alpha \times W + (MPLC\alpha)^2 \times W) - C_{ik}$$
$$= p \times \frac{W}{1 - MPLC\alpha} + \frac{MPLC\alpha W}{1 - MPLC\alpha} - C_{ik}$$

ii Application to Korean Economy

a) Cost of In-kind Transfer

C_{ik} for in-kind transfer is 7 times the cost for cash-transfer (Wicker, 2017). Therefore, I will use $1.26W(= 0.18W \times 7)$. The net effect when using in-kind transfer totally depends on the size of p.

b) Substitution

Substituting 0.758 into MPLC and 0.33 into α, the formula gives:

$$\varepsilon_{ik} = p \times \frac{W}{1 - MPLC\alpha} + \frac{MPLC\alpha}{1 - MPLC\alpha} W - C_{ik}$$
$$\simeq (\mathbf{1.33}\boldsymbol{p} - \mathbf{0.93})\boldsymbol{W}$$

Findings and Discussion

Applying game theory approach to the Korean economy, I identified that Greater Seoul areas would not introduce local currency, but the regions would do so, according to the Nash Equilibrium. Then, the region would see an increase in net welfare compared to the situation where they did not introduce local currency. Although it is true that Greater Seoul would lose some welfare at the equilibrium, I clarify that the purpose of introducing local currency is to boost the local economy. Vitalising the local community at the expense of welfare of Greater Seoul would be worthwhile if the local community were to develop and ultimately brings balanced national growth. This demonstrated that the use of local currency even when other areas also introduce local currency still benefits the local currency at the equilibrium level.

On the other hand, this paper investigated the net local economic effect for each method of transfer payments. The net local economic effect resulting from cash transfer, local currency transfer and in-kind transfer was respectively $0.15W, 0.86W, (1.33p - 0.93)W$. The impact of introducing local currency is higher by $0.71W (= 0.86W - 0.15W)$ than that from cash transfer. This is mainly because the use of local currency prevents consumption being withdrawn to other areas in the first place. For in-kind transfer, even if p is 1 as a best-case scenario, which is unlikely, ε_{ik} is $0.4W$, which is still a lot smaller than the $0.86W$ given by ε_{lc}.

Not only is ε_{ik} already smaller than ε_{lc} even if p is 1, but in fact p is only 20% on average, according to Hwang (2021). Due to the Korean system, this value of 20% is unlikely to change. In the case of in-kind transfer, it is carried out by entrusting the work to the central government, purchasing goods at once, and then distributing them to local governments. Since the entire region will be considered in the process, one item could be produced from one region, but 100% of items being produced in a single region is highly unlikely. This is why many papers assume in the model that in-kind transferred goods are sourced from other areas. For example, Cunha, De Giorgi and Jayachandran (2015) stated that "the type of transfer we consider is one in which the supply is sourced from outside the economy that receives the transfer".

Therefore, local currency is better than the other two policies as a method of transfer payments.

The analysis in this paper has shown that local currency transfer supports small businesses and local businesses over five times more than cash transfer and at least twice as much as in-kind transfer. According to the Nash Equilibrium, I identified that Greater Seoul areas would not introduce local currency, but the region would introduce local currency in the case of the Korean economy. However, due to insufficient research, many local governments in Greater Seoul issued local currency since the COVID-19 pandemic. Although it will converge into the Nash Equilibrium in the long term if local currency policy maintains, too much resource will have been wasted by then. Therefore, to maximise this beneficial impact of local currency, it is crucial for policymakers from different areas to communicate and regulate if needed, so that only small regions within certain criteria can issue local currency. Then the economy would not need to waste resources before reaching Nash Equilibrium.

Conclusion

I have compared local currency transfer with other policies: cash transfer and in-kind transfer. This paper discussed why the government is concerned with controlling offshore outflow and how important the local economy is. I compared local currency transfer with cash transfer and then with in-kind transfer. As a result, I concluded that local currency transfer is better than other policies as it produces a greater net economic impact to the local economy. By comparing the effectiveness of local currency transfers with traditional cash and in-kind transfers, I came to the conclusion that local currencies are likely to be effectively used to deter offshore outflows, thus stimulating local economic activity.

Evaluation

Although all the procedures have been modelled to resemble the reality as much as possible, I faced several limitations in modelling and simplified certain aspects to build a suitable model. For example, local currency is issued by the local government and, because of that, cost would go into the region and results in further increase in local income. However, for the simplicity of the model, I ignored this. The effect of the multiplier effect highly depends upon how close the Aggregate Demand curve is to the full employment level. If I had more resources to access data such as how much of the spending went on sectors other than restaurant or supermarket, the precision of the analysis might have been better.

In order to focus on the effectiveness of policy, I deliberately ruled out consumer utility from using each transfer type and related argument about paternalism, which is an action that limits a person's or group's liberty or autonomy

and is intended to promote their own good (Dworkin, 2020). If those could be quantified and reflected into the model I made, the model would have shown more aspects of the economy.

I considered the models to be static. If time had also been considered, then the model would have been more complicated by taking into consideration the next move of different stakeholders. In this case, I would have had to consider the budget plan of government. This may have been possible with more time and resources.

Despite the limitations, I believe that findings from this study suggested practical implications to groups that may initiate local currency movements in their own communities.

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