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Reconsidering the Immiserizing Growth in a Simple Domestic Macroeconomic Model with Financial Assets

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ABSTRACT

Technological progress does not always lead to increased income or improved well-being. Bhagwati (1958) demonstrated that if a country's exports rise due to technological advances, international prices may fall sharply, potentially reducing overall economic welfare—a phenomenon known as "Immiserizing Growth." Similarly, Prebisch (1950) and Singer (1950) argues that developing countries, which primarily export raw materials, face worsening terms of trade as raw material prices decline over time. Corden and Neary (1982) identified a related issue, "Dutch Disease," where resource booms lead to the decline of other industries, slowing economic growth. This paper extends Fujita (2025) by constructing a macroeconomic model that incorporates financial assets. It shows that technological progress can raise the trading volume of the financial assets while reducing nominal GDP.

Keywords: immiserizing growth, domestic macroeconomy, technological progress, nominal GDP, financial assets.

INTRODUCTION

It has been widely studied that technological progress does not necessarily result in increased income or improved well-being. One of the most important early works on this topic is Bhagwati (1958), which highlights the role of terms of trade. Bhagwati showed that if a country experiences technological progress, an oversupply of its exports can cause international market prices to drop sharply. As a result, the country's overall economic welfare may decline, a phenomenon known as "Immiserizing Growth."

Similarly, Prebisch (1950) and Singer (1950) found that when developing countries mainly export raw materials while developed countries export manufactured goods, the prices of raw materials tend to fall over time. This leads to worsening terms of trade for developing countries, preventing technological progress from improving living standards. This idea is known as the "Prebisch-Singer Hypothesis."

Corden and Neary (1982) also identified a related problem. They demonstrated that when a country discovers natural resources or expands resource exports, other industries may shrink, slowing overall economic growth. They called this effect "Dutch Disease."

This paper takes a different approach by constructing a simple domestic macroeconomic model that incorporates financial assets, extending Fujita (2025). It will be shown that an economy can experience the immiserizing growth if the price of goods drops sharply due to an increase

in their supply. In other words, technological progress can raise the trading volume of the financial assets while reducing nominal GDP.

The structure of this paper is as follows. Section 2 lays out the basic model and section 3 reveals that an economy can experience immiserizing growth. Concluding remarks are made in section 4.

BASIC MODEL

Let us consider a domestic macro economy where goods and financial assets are traded with money, the amounts of which in period t is denoted as Y_t, S_t and M_t, respectively. It is assumed that in each period, the financial assets are purchased and held for only one period before being sold, and that output of the goods in period t-1 constitutes the income in period t, so that, by letting P_t and Q_t denote the prices of the goods and the financial assets in period t, total income in period t, M_t, which is equal to the amount of the money in period t, is expressed as

$$M_t = P_{t-1}Y_{t-1}+(Q_t-Q_{t-1})\,S_{t-1}, \tag{1}$$

sum of income from the output of the goods and the capital gain from the financial assets. Here, the principle of three-sided equivalence (Keynes (1936), Kuznets (1941) etc.) is used, specifically that production GDP is equal to distribution GDP.

It is assumed that the total income in period t, M_t, is, in turn, used to purchase the goods and the financial assets in period t. Since the expenditure on the goods in period t is P_tY_t and the expenditure on the financial assets in period t is Q_tS_t, the budget constraint in period t is expressed as

$$M_t=P_tY_t+Q_tS_t. \tag{2}$$

We assume that demand for the goods in period t increases with the total income net of expenditure on the financial assets in period t, $M_t- Q_tS_t$, and decreases with the price of the goods in period t, P_t, and specify the demand function for the goods in period t, Y_t^D, as

$$Y_t^D=\frac{A+c(M_t-Q_tS_t)}{P_t^{\varepsilon}}, \tag{3}$$

where A and ε are positive constants and c is a parameter that satisfies $0<c<1$, while supply of the goods in period t, Y_t^S, grows at the rate of g through technological progress, with its initial value to be Y, so that

$$Y_t^S =(1+g)^{t-1}Y. \tag{4}$$

The assumption of full employment is made here. We also assume that $Y_t^D =Y_t^S=Y_t$ holds in the equilibrium, so that

$$(1+g)^{t-1}Y =\frac{A+c(M_t-Q_tS_t)}{P_t^{\varepsilon}}. \tag{5}$$

TECHNOLOGICAL PROGRESS, IMMISERIZING GROWTH AND TRADING VOLUME OF FINANCIAL ASSETS

Now, we are ready to reveal the condition under which an economy can experience immiserizing growth.

Firstly, substituting (2) into (5) and rearranging the terms yield

$$P_t(1+g)^{t-1}Y = \frac{A}{P_t^{\varepsilon-1}-c}. \tag{6}$$

Since the left-hand of (6) is nominal GDP in period t, we can see that nominal GDP and $P_t^{\varepsilon-1}-c$ are negatively correlated. If $P_t^{\varepsilon-1}-c$ increases over time, nominal GDP decreases over time, while if $P_t^{\varepsilon-1}-c$ decreases over time, nominal GDP increases over time.

From (6), we also have the formula to determine P_t as

$$P_t(P_t^{\varepsilon-1}-c) = \frac{A}{(1+g)^{t-1}Y}. \tag{7}$$

Since P_t is determined as point A and point B as shown in Figure 1 when ε<1, we can see P_t decreases over time if ε<1 and P_t is determined as point A, as the line $\frac{A}{(1+g)^{t-1}Y}$ shifts downwards over time, which leads to the following Lemma.

Lemma

- *P_t decreases over time if* ε<1.

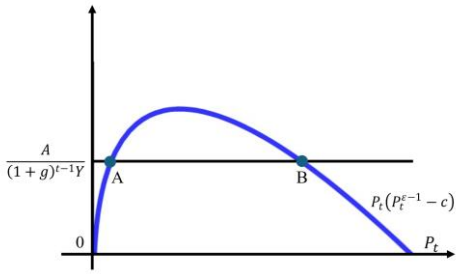

Figure 1: Determination of P_t in the case of ε<1

Graph of (6), on the other hand, is depicted as an increasing curve as in Figure 2 if ε<1.

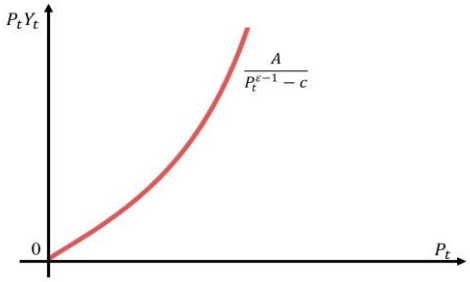

Figure 2: Graph of P_tY_t in the case of ε<1

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From Figure2, we can see that P_tY_t decreases in response to a decrease in P_t if ε<1. Combined with the above Lemma, this establishes the following Proposition1.

Proposition 1

- *In the case of ε<1, an economy experiences an immiserizing growth, as technological progress reduces nominal GDP.*

From the inverse demand function for the goods, (8), which is derived from (3), we see that the graph of the demand curve for goods shifts downward if ε decreases, as shown in Figure 1.

$$P_t = \{\frac{A+c(M_t-Q_tS_t)}{Y_t^D}\}^{\frac{1}{\varepsilon}}. \quad (8)$$

This means that if ε is small enough to satisfy ε<1, prices drop sharply in response to an increase in supply, leading the economy into an immiserizing growth.

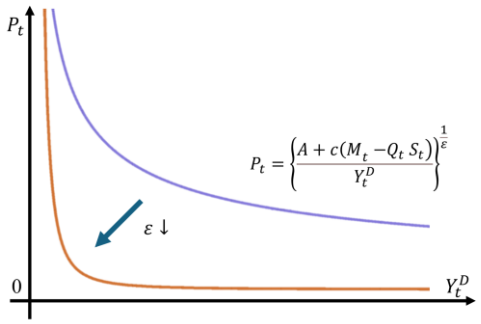

Figure 3: Shift of demand curve for goods

From (2), on the other hand, we have the expenditure on the financial assets in period t as

$$Q_tS_t=M-P_tY_t. \quad (9)$$

Thus, we obtain the following Proposition2.

Proposition 2

- *If an economy is experiencing an immiserizing growth, technological progress increases the expenditure on financial assets.*

Combining (1) and (2), we have $Q_t=2Q_{t-1}$. Thus, assuming $Q_1=Q$, we obtain

$$Q_t=2^{t-1}Q. \quad (10)$$

Substituting (10) and the expression $P_tY_t = \frac{A}{P_t^{\varepsilon-1}-c}$, which is derived from (6), into $S_t = \frac{M-P_tY_t}{Q_t}$, which is derived from (2), we have the trading volume of the financial assets in period t, S_t, as

$$S_t = \frac{M - \frac{A}{P_t^{\varepsilon-1} - c}}{2^{t-1}Q}, \tag{11}$$

which completes the model.

CONCLUDING REMARKS

In the present paper, we developed a simple domestic macroeconomic model that includes financial assets. Our goal was to show that an economy can experience immiserizing growth if an increase in the supply of goods causes prices to drop significantly. We also demonstrated that technological progress could drive up the trading volume of the financial assets while lowering nominal GDP.

To make our findings more robust, we need to test them in a broader framework that includes unemployment and so on. Additionally, it would be valuable to extend the model so that the growth rate is determined internally. We will explore these topics in our next research.

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