<table>
<thead>
<tr>
<th>Title</th>
<th>Conditions for Successful Resource-based Industrialization without Dutch Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author(s)</td>
<td>Takagi, Yoko</td>
</tr>
<tr>
<td>Editor(s)</td>
<td></td>
</tr>
<tr>
<td>Issue Date</td>
<td>1996-03-31</td>
</tr>
<tr>
<td>URL</td>
<td><a href="http://hdl.handle.net/10466/971">http://hdl.handle.net/10466/971</a></td>
</tr>
<tr>
<td>Rights</td>
<td></td>
</tr>
</tbody>
</table>
Conditions for Successful Resource-based Industrialization without Dutch Disease

Yoko Takagi

1. Introduction

W. Max Corden and J. Peter Neary developed an interesting article on the de-industrialization in a small open economy when a boom occurs in the energy sector. This phenomenon is sometimes called “Dutch disease”. This expression comes from the natural gas in the Netherlands, but we can see a number of examples of the same kind all over the world, both developed and developing countries.

There are three sectors in their model, energy, manufactures and services. Of these three sectors, the first and the second are traded goods and the last is the non-traded good. They examined the effects of a boom in the energy sector on the level of manufacture production, the functional distribution of income and the extent of profitability of three sectors. Above all, they concluded that the de-industrialization could necessarily happen in the case of the specific factor model where each of the three sectors uses a single immobile specific factor as well as a factor which is perfectly mobile between sectors. In this model, the demand for the only freely mobile factor (labor) increases in the booming sector and this sector attracts more labor, then the remaining sectors, both manufactures and domestic services, would shrink as the primary effect. The income, however, goes up due to the wage increase so that the demand for domestic services also increases and the price of this sector will tend to go up. Because of the resulting shift up of the value of marginal productivity curve it draws more labor and the wage rate increases further in the domestic services sector. The production of manufactures would decrease more. This is the essence of the de-industrialization or Dutch disease.

Let us turn to the developing countries, where the representative indus-

---

1 “Booming sector and de-industrialization in a small open economy,” The Economic Journal 92 (December 1982), 825-848.
tries consist of primary product and manufactures in general. Abundant primary products have been exporting to the developed countries for a long time. But recently they try to produce manufactures by making use of such abundant primary products in several countries, that is called resource-based industrialization. We already have many literature on this topic, "however, it is not obvious that resource-based industrialization is better suited to achieve national development goals than other potential strategies." At present, there seem to be more answers 'no' rather than 'yes'. None of the answers, however, would not be derived from the strict economic analysis.

The examples of resource-based industrialization are as follows: Lumber and board products from timber in Indonesia and Malaysia; Instant coffee from coffee beans in Brazil; Butter and paste from cocoa in Ghana; Canned pineapple from pineapple fruit in Philippine; Pewter from tin in Malaysia and Thailand; Laundry soap from palm oil and tire industry from rubber both in Malaysia; And many kinds of different processed products from mineral including oil in resource rich countries.

The purpose of this paper is to obtain the conditions for successful resource-based industrialization without Dutch disease within the framework shown by Corden and Neary.

2. Model

The economy consists of three sectors, the first producing manufactures denoted by $M$, the second producing primary products $R$ and the last resource-based industry denoted by $F$ which uses primary products as an intermediate input. We assume that each of three sectors uses a single specific factor, capital $K$ in manufacture, land $T$ in primary sector and the intermediate input $R$ in resource-based industry. General factor of production, labor, moves freely between three sectors and perfectly flexible wages ensure full employment. Each production function is represented as

---

Michael Roemer, "Resource-based Industrialization in the developing countries; a survey", *Journal of Development Economics* 6 (1979), p. 164. Findlay has some doubts about that name in a slightly different situation from ours. "It is not clear, however, why the phenomenon should be referred to as a 'disease'. Relative price shifts always help some sectors and harm others. What matters for overall national welfare is whether the country is a net exporter or importer of the good that experiences a rise in its relative price." *The Primary Sector in Economic Development*, Croom Helm (London & Sydney) 1985. p. 232.
$$R = R(L_R, T)$$
$$F = F(L_F, R)$$
$$M = M(L_M, K)$$

Generally speaking, primary products $R$ are not wholly used for the production of $F$ goods, but are partly exported to the rest of the world. In the next section, we will show the case where the primary products cannot be traded. In Indonesia the export of the timber is prohibited so that it must be non-traded good. In this section, however, primary commodity is partly exported, and partly used domestically as an input to produce resource-based industry good. The following chart would help us to understand our situation. Resource-based goods $F$ may be regarded as another intermediate goods which are restrictedly used in the foreign country, or may be final goods used in both domestic and foreign countries. This stage of development is called “export substitution”, and the final stage where manufactured goods are produced in its own country with imported capital goods, is known as “import substitution”. Our model in this section constitutes the mixture of import substitution and resource-based industrialization.

First we handle with the case where manufactured goods are home goods and are not traded internationally due to import substitution policy. Primary products $R$ and resource-based goods $F$ are exported in the case of excess supply in the domestic market, and imported in the case of excess demand. However, at the stage of development process the possibility of importing $R$ may be excluded. In the Corden–Neary model manufactured goods cannot be considered as home goods, since their model was applied for developed countries.
The following four conditions are for full employment,

\[ C_{LF}F + C_{LM}M + C_{LR} = L \]  \hspace{1cm} (1)
\[ C_{KM}M = K \]  \hspace{1cm} (2)
\[ C_{RF}F = R_F \]  \hspace{1cm} (3)
\[ C_{TR}R = T \]  \hspace{1cm} (4)

Assuming perfect competition,

\[ C_{LF}w + C_{RF}P_R = P_F \]  \hspace{1cm} (5)
\[ C_{LM}w + C_{KM}r = P_M \]  \hspace{1cm} (6)
\[ C_{LR}w + C_{TR}q = P_R = 1 \]  \hspace{1cm} (7)
\[ C_{\theta} = C_{\theta}(r, w, q, P_R = 1) \]  \hspace{1cm} (8)

We take primary product, one of the traded goods, as numeraire so that the prices of both commodities and factors of production are measured in terms of primary products. Price of traded good is internationally given because of the assumption of small country. Only the price of manufactured good is determined by the interaction between domestic supply and demand. \( C_{\theta} \) stands for the quantity of factor \( i \) used per unit of output in sector \( j \). \( w, r, q, \) and \( P_R \) are rewards received by labor, capital, land and primary product as an intermediate goods. There are 13 independent equations so that the system is closed.

Totally differentiating equation (1) to equation (7), and rearranging them, we have

\[ \lambda_{LF}\ddot{F} + \lambda_{LM}\ddot{M} + \lambda_{LR}\ddot{R} = \ddot{L} - (\lambda_{LF}\ddot{C}_{LF} + \lambda_{LM}\ddot{C}_{LM} + \lambda_{LR}\ddot{C}_{LR}) \]  \hspace{1cm} (9)
\[ \ddot{M} = \ddot{K} - \ddot{C}_{KM} \]  \hspace{1cm} (10)
\[ \ddot{F} = \ddot{R}_F - \ddot{C}_{RF} \]  \hspace{1cm} (11)
\[ \ddot{R} = \ddot{T} - \ddot{C}_{TR} \]  \hspace{1cm} (12)
\[ \theta_{LF}\ddot{w} = \pi \]  \hspace{1cm} (13)
\[ \theta_{LM}\ddot{w} + \theta_{KM}\ddot{r} = \ddot{P}_M \]  \hspace{1cm} (14)
\[ \theta_{LR}\ddot{w} + \theta_{TR}\ddot{q} = 0 \]  \hspace{1cm} (15)

The following conditions for cost minimization

\[ \theta_{LM}\ddot{C}_{LM} + \theta_{KM}\ddot{C}_{KM} = 0 \]  \hspace{1cm} (16)
\[
\theta_{LF}\dot{C}_{LF} + \theta_{RF}\dot{C}_{RF} = 0 \\
\theta_{LR}\dot{C}_{LR} + \theta_{TR}\dot{C}_{TR} = 0
\]  

(17)  

(18)

and the conditions for small country

\[
\tilde{P}_F = \tilde{P}_R = 0
\]

are used in order to derive equations (13) to (15), where \( \lambda_j (j = F, M, R) \) is the proportion of labor used in sector \( j \). \( \theta_i (i = L, K, R, T; j = F, M, R) \) is the share of factor \( i \) in the value of output in sector \( j \), and \( \pi \) is the policy parameter for the resource-based industrialization. When the government is supporting \( F \) industry to grant a subsidy, the producers of this industry have an advantage in cost conditions as expressed in (13).

The following three relations can be derived from the definitions of the elasticity of substitution between factors,

\[
\dot{C}_{LM} - \dot{C}_{KM} = -\sigma_M(\tilde{w} - \tilde{r}) \\
\dot{C}_{LR} - \dot{C}_{TR} = -\sigma_R(\tilde{w} - \tilde{q}) \\
\dot{C}_{LF} - \dot{C}_{RF} = -\sigma_F\tilde{w}
\]  

(19)  

(20)  

(21)

Then each \( C_{ij} \) can be obtained from (16), (17), (18), (19), (20) and (21) as follows:

\[
\dot{C}_{LM} = -\theta_{KM}\sigma_M(\tilde{w} - \tilde{r}) \\
\dot{C}_{LR} = -\theta_{TR}\sigma_R(\tilde{w} - \tilde{q}) \\
\dot{C}_{LF} = -\theta_{RF}\sigma_F\tilde{w}
\]

\[
\dot{C}_{KM} = \theta_{LM}\sigma_M(\tilde{w} - \tilde{r}) \\
\dot{C}_{TR} = \theta_{LR}\sigma_R(\tilde{w} - \tilde{q}) \\
\dot{C}_{RF} = \theta_{LF}\sigma_F\tilde{w}
\]  

(22)

From (13), (14) and (15),

\[
\tilde{w} = \frac{1}{\theta_{LF}}\pi
\]  

(23)

\[
\tilde{q} = -\frac{\theta_{LR}}{\theta_{TR}\theta_{LF}}\pi
\]  

(24)

\[
\tilde{r} = \frac{1}{\theta_{KM}}\left(\tilde{P}_M - \frac{\theta_{LM}}{\theta_{LF}}\pi\right)
\]  

(25)

so that we have
\[ \bar{w} - \bar{r} = \frac{1}{\theta_{LF}\theta_{KM}} \pi - \frac{1}{\theta_{KM}} \bar{P}_M \]  

(26)

and

\[ \bar{w} - \bar{q} = \frac{1}{\theta_{LF}\theta_{TR}} \pi \]  

(27)

Substituting (23), (26) and (27) into (22), and substituting them into (10), (11) and (12) again, we have changes in production quantities.

\[ \tilde{M} = \tilde{K} - \frac{\theta_{LM}\sigma_m}{\theta_{LF}\theta_{KM}} \pi + \frac{\theta_{LM}\sigma_M}{\theta_{KM}} \bar{P}_M \]  

(28)

\[ \tilde{F} = \tilde{T} - \left( \frac{\theta_{LR}\sigma_R}{\theta_{LF}\theta_{TR}} + \sigma_F \right) \pi \]  

(29)

\[ \tilde{R} = \tilde{T} - \frac{\theta_{LR}\sigma_R}{\theta_{LF}\theta_{TR}} \pi \]  

(30)

This model has the special feature that the price of domestic goods affects only its own good; \( \tilde{F} \) and \( \tilde{R} \) are independent of \( \bar{P}_M \). Next job we have to do is to get \( \bar{P}_M \). In order to do so, we first have the relation (31) which is obtained by substituting (10), (11) and (12) into (9) and also substituting (22) into it.

\[ (\lambda_{LF}\sigma_F + \lambda_{LM}\sigma_M + \lambda_{LR}\sigma_R + \lambda_{LF}\theta_{LR}\sigma_R) \bar{w} - \lambda_{LM}\sigma_M \bar{r} - \sigma_R(\lambda_{LR} + \lambda_{LF}\theta_{LR}) \bar{q} \]

\[ = (\lambda_{LF} + \lambda_{LR}) \tilde{T} + \lambda_{LM}\tilde{K} - \tilde{L} \]  

(31)

\( \bar{P}_M \) is represented by the changes in factor of production, \( \tilde{T}, \tilde{K} \) and \( \tilde{L} \) by substituting (23) (24) and (25) into (31).

\[ \frac{\lambda_{LM}\sigma_M}{\theta_{KM}} \bar{P}_M = \tilde{L} - \lambda_{LM}\tilde{K} - (\lambda_{LF} + \lambda_{LR}) \tilde{T} \]

\[ + \left( \frac{\lambda_{LF}}{\theta_{LF}\sigma_F} + \frac{\lambda_{LM}}{\theta_{LF}\theta_{KM}} \sigma_M + \frac{\lambda_{LR} + \lambda_{LF}\theta_{LR}}{\theta_{LF}\theta_{KM}} \sigma_R \right) \pi \]  

(32)

The increase in \( \pi \) as the resource-based industrialization policy decreases the production of \( F \) and \( R \). Whether Dutch disease occurs or not, however, depends on the relative magnitude of \( \pi \) and \( \bar{P}_M \) as conjectured by
equation (28). Substituting (32) into (28), $\tilde{M}$ can be expressed with $\pi$.

\[
\tilde{M} = \frac{\theta_{LM}}{\lambda_{LM}} \tilde{L} + \theta_{KM} \tilde{K} - \frac{\theta_{LM}}{\lambda_{LM}} (\lambda_{LF} + \lambda_{LR}) \tilde{T} \\
+ \left( \frac{\theta_{LM} \lambda_{LF}}{\theta_{LF} \sigma} + \frac{\theta_{LM} \lambda_{LR} + \lambda_{LF} \theta_{LR}}{\theta_{LF} \theta_{KM} \sigma} \right) \pi
\]  

(28)' tells us that Dutch disease does not occur in our case because

\[
\frac{\partial \tilde{M}}{\partial \pi} > 0.
\]

To sum up, the production of manufacture is increased, but neither $F$ nor $R$ increased by the resource-based industrialization policy. This situation will be shown in the figure below which Corden-Neary used in their paper. The vertical axis represents the wage rate of manufactured good in the left hand side, and primary products and the resource-based industry in the right hand side in terms of manufactured goods. The horizontal axis $O_D O_T$ measures the amounts of labor, the distance from $O_D$ shows the labor input for domestic good and the distance from $O_T$ is the labor input for traded goods, the primary and resource-based goods in this case. The decreasing function of the wage rate $L_M$ and $L_R$ are the demand schedules for labor in manufacturing and primary sectors, and $L_T$ is the demand for labor in traded goods sectors, $R$ and $F$. Since we assumed that the prices of the traded goods are given in the world market, we can add the demand schedule of $R$ sector to $F$ sector laterally. The difference between $L_T$ and $L_R$ shows the demand for labor in resource-based industry $F$. 

![Diagram of labor demand and wage rates](https://via.placeholder.com/150)
First the increase in $\pi$ shifts $L_T$ to $L_T'$. Wages go up to $w_1$ from $w_0$. The share of labor employment in resource-based industry rises, but the shares of labor in manufactures and primary sectors decrease. In primary sector, however, the decrease of the production will cause to shift $L_T$ curve somewhat back if we do not have any increase in land. Furthermore $\tilde{P}_M > 0$ in (32) shifts $L_M$ curve up to $L_M'$ so that the final configuration will be shown as the dotted lines in the figure above. $L_R$ curve does not change when

$$\tilde{P}_R = 0 \quad \text{and} \quad \tilde{T} = 0.$$ 

The equation (30) determines how much the production of primary product decrease by the resource-based industrialization (the increase in $\pi$).

$$\tilde{R} = \tilde{T} - \frac{\theta_{LR} \sigma_R}{\theta_{LF} \theta_{TR}} \pi$$  

(30)

The larger are the elasticity of substitution and the labor share in primary sector, the more does the production of primary product decrease. Contrary to that, the larger are the land share in primary sector and the labor share in resource-based industry, the less does the production of primary product decrease. That the labor share of resource-based industry is large means that the decrease in $R$ does not affect the decrease in $F$ production. In the final equilibrium $\omega$ is necessarily raised as shown in equation (23). Finally substituting (32) into (25), we can get the effect of rental rate by resource-based industrialization,

$$\frac{\partial \tilde{\gamma}}{\partial \pi} = \frac{\lambda_{LF}}{\lambda_{LM} \theta_{LF}} \sigma_F + \frac{1}{\theta_{LF}} \frac{\lambda_{LR} + \lambda_{LF} \theta_{LR}}{\lambda_{LM} \theta_{LF} \theta_{KM}} \sigma_M > 0$$  

(33)

Now we summarize the effect of resource-based industrialization policy according to the sectors in order as follows:

*Primary product ($R$)*; Value of the product decreases. The amount of land $T$ is constant, but $q$ is decreased, then the land owner’s income $Tq$ is diminished. Corden–Neary called this $q$ as one of the measures of profitability due to the resource-based industrialization. We will judge from the value of this measure whether this sector can be expanded or not in future. In this sense, above conclusion that we have just got will
be discouraged.

**Resource-based industry (F)**; The production of this sector decreases in the end although resource-based industrialization policy is adopted under the sponsorship of the government. This seems to be strange, but it is the cold and hard facts of the situation\(^{111}\). Countries producing primary products generally advocate the resource-based industrialization policy at first. None of them are, however, successful at the end. The sector of resource-based industry does not expand effectively. The essential cause of this phenomena is the reduction of primary product as an intermediate input for the resource-based industry when the price of that product is given in the world market.

**Manufacturing sector (M)**; Dutch disease does not happen. On the contrary it grows smoothly. Furthermore (33) shows the increase in profitability of this sector by resource-based industrialization policy, that is, manufacturing sector would be the one to profit from it.

Now are there any measures not to decrease the production of resource-based industry by the resource-based industrialization policy? The only solution is to raise the supply of land \(T\). This plays the role to stop the reduction of primary product, that is the same thing as the reduction of resource-based industry. Moreover, the increase in \(T\) turns to the advantages in \(F\) and \(R\) concerning the labor allocation because the increase in \(T\) affects on \(M\) negatively so that the expansion of \(M\) industry may be slightly offset. The increase in \(T\), however, cannot continue forever. The supply of land will reach the limit at an earlier time than any other factors of production as labor and capital, so that we cannot hope this aspect.

### 3. Extension of our model

In this section we treat the case where import substitution phase had passed through so that the manufacturing sector is no longer the non-traded good but the traded good whose price is given internationally. This situation belongs to Corden–Neary framework. In our case we assume that the government continues to adopt the resource-based industrialization policy in

\(^{111}\) This case just corresponds to the case where the import restriction aiming to do away with the current account deficit may increase the deficit in some cases. In fact, it is known that import restriction increases the current account deficit in the short run when direct investment will be increased by that import restriction.
the $F$ sector.

At this stage primary product is prohibited to export unprocessed, then primary product becomes domestic good. $\bar{P}_M$ is equal to zero since the price of manufactured product is given from the world market and the price of primary product is determined domestically this time: According to the chart in section 2 this stage would be the combination of export promotion and resource-based industrialization, because all the product of primary sector are demanded domestically and exported only after they are processed into resource-based good $F$. Now the equations (13) (14) and (15) change as follows, where manufacturing good is selected as numeraire.

$$\theta_{LF}\bar{w} + \theta_{RF}\bar{P}_R = \pi$$  \hspace{1cm} (13)'
$$\theta_{LM}\bar{w} + \theta_{KM}\bar{P} = 0$$  \hspace{1cm} (14)'
$$\theta_{LM}\bar{w} + \theta_{TR}\bar{q} = \bar{P}_R$$  \hspace{1cm} (15)'

One of the definitions of the elasticity of substitution (21) becomes

$$\bar{C}_{LF} - \bar{C}_{RF} = -\sigma_F(\bar{w} - \bar{P}_R)$$  \hspace{1cm} (21)'

Moreover the last row in (22) will be rewritten as

$$\bar{C}_{LF} = -\theta_{RF}\sigma_F(\bar{w} - \bar{P}_R) \hspace{1cm} \bar{C}_{RF} = \theta_{LF}\sigma_F(\bar{w} - \bar{P}_R)$$

The specific factor in resource-based industry, $R_F$, has the special feature which is different from the specific factor in manufacturing sector $K$ and specific factor in primary product $T$. $RF$ is not the independent fixed variable, but the product produced in primary sector. Then we can eliminate $R_F$, and at the same time $P_F$ can be expressed by $\bar{w}$ and $\bar{q}$ from (15)', so that three equations (13)' to (15)' is reduced to two equations. By eliminating $R_F$, $\bar{C}_{LF}$ and $\bar{C}_{RF}$ can be rewritten as

$$\bar{C}_{LF} = -\theta_{RF}\theta_{TR}\sigma_F(\bar{w} - \bar{q}) \hspace{1cm} \bar{C}_{RF} = \theta_{LF}\theta_{TR}\sigma_F(\bar{w} - \bar{q})$$  \hspace{1cm} (34)

$F$ industry is using $T$ after all, through middle product $R_F$, so (34) describes such an effect explicitly.

Putting the relations necessary in order to develop the statements one by one,
\[ \lambda_{LF} F + \lambda_{LM} \tilde{M} = \tilde{L} - \lambda_{LR} (\tilde{T} - \tilde{C}_{TR}) - (\lambda_{LF} C_{LF} + \lambda_{LM} C_{LM} + \lambda_{LR} C_{LR}) \]  
(35)

\[ \tilde{M} = \tilde{K} - \tilde{C}_{KM} \]  
(36)

\[ \tilde{F} = \tilde{T} - \tilde{C}_{TR} - \tilde{C}_{RF} \]  
(37)

\[ (\theta_{LF} + \theta_{RF} \theta_{LR}) \tilde{w} + \theta_{RF} \theta_{TR} \tilde{q} = \pi \]  
(38)

\[ \theta_{LM} \tilde{w} + \theta_{KM} \tilde{r} = 0 \]  
(39)

Coefficient of \( \tilde{w} \) in equation (38) represents the share of income attributed to the labor which are necessary in resource-based industry both in directly and indirectly; which include the laborer in the \( F \) sector as well as in the \( R \) sector. Likewise the coefficient of \( \tilde{q} \) in (38) represents the income share of land in the \( F \) sector; \( F \) sector uses land indirectly by using primary product as an input. As shown in the former section, \( C_u \) can be obtained by the definitions of elasticity of substitution and the cost minimizing conditions,

\[ \tilde{C}_{LM} = - \theta_{KM} \sigma_M (\tilde{w} - \tilde{r}) \quad \tilde{C}_{KM} = \theta_{LM} \sigma_M (\tilde{w} - \tilde{r}) \]
\[ \tilde{C}_{LR} = - \theta_{TR} \sigma_R (\tilde{w} - \tilde{q}) \quad \tilde{C}_{TR} = \theta_{LR} \sigma_R (\tilde{w} - \tilde{q}) \]
\[ \tilde{C}_{LF} = - \theta_{RF} \theta_{TR} \sigma_F (\tilde{w} - \tilde{q}) \quad \tilde{C}_{RF} = \theta_{LF} \theta_{TR} \sigma_F (\tilde{w} - \tilde{q}) \]  
(40)

Substituting (40) into (35), (36), (37), (38) and (39), we have the complete system which has five equations and five unknowns, \( \tilde{F}, \tilde{M}, \tilde{w}, \tilde{q} \) and \( \tilde{r} \) with parameters \( \tilde{L}, \tilde{T}, \tilde{K} \) and \( \pi \). The results are

\[ \tilde{w} = \frac{1}{\Delta} \left[ \lambda_{LF} \tilde{T} + \lambda_{LM} \tilde{K} - \tilde{L} + \left( \lambda_{LF} \sigma_F + \frac{(\lambda_{LR} + \lambda_{LF} \theta_{LR}) \sigma_R}{\theta_{TF}} \right) \pi \right] \]

\[ \tilde{r} = - \frac{\theta_{LM}}{\theta_{KM}} \tilde{w} \]

\[ \tilde{q} = - \frac{1}{\theta_{TF}} (\pi - \tilde{q} \tilde{w}) \]

\[ \tilde{M} = \tilde{K} - \theta_{LM} \sigma_M \tilde{w} \]

\[ \tilde{F} = \tilde{T} + \theta_{LR} \sigma_R + \frac{\theta_{LF} \theta_{TR} \sigma_F}{\theta_{TF}} (\pi - \tilde{w}) \]

where

\[ \tilde{\theta}_{LF} = \theta_{LF} + \theta_{RF} \theta_{LR} \]
\[ \tilde{\lambda}_{LF} = \lambda_{LF} + \lambda_{LR} \]
\[ \tilde{\theta}_{TF} = \theta_{RF} \theta_{TR} \]
The first two are the share of labor income and the share of labor necessary
directly and indirectly to produce resource-based industry $F$, and the last one
is the share of land income to produce $F$ good indirectly. And also

$$
\Delta = \left[ \lambda_{LF} \sigma_F + \lambda_{LM} \sigma_M + \left( \lambda_{LR} + \frac{\theta_{LM} \lambda_{LF}}{\theta_{TF}} \right) \sigma_R \right] > 0
$$

Now when we put $\alpha$, $\beta$ and $\gamma$ as

$$
\alpha = \frac{\lambda_{LM}}{\theta_{KM}} \quad \beta = \frac{\lambda_{LF}}{\theta_{RF}} \quad \gamma = \frac{\lambda_{LR} + \theta_{LM} \lambda_{LF}}{\theta_{TF}}
$$

then the factor prices can be rewritten neatly,

$$
\tilde{w} = \frac{1}{\Delta} \left[ \lambda_{LF} \tilde{T} + \lambda_{LM} \tilde{K} - \tilde{L} + (\beta \sigma_F + \gamma \sigma_R) \pi \right]
$$

$$
\tilde{r} = -\frac{\theta_{LM}}{\theta_{KM}} \tilde{w}
$$

$$
\tilde{q} = \frac{1}{\theta_{TF}} \left( \pi - \tilde{\theta}_{LF} \tilde{w} \right)
$$

where \( \Delta = (a \sigma_M + \beta \sigma_F + \gamma \sigma_R) > 0 \)

The effect on the production of manufactured good is

$$
\tilde{M} = \frac{1}{\Delta} \left( \theta_{KM} a \sigma_M + \beta \sigma_F + \gamma \sigma_R \right) \tilde{K}
$$

$$
-\frac{\theta_{LM}}{\theta_{KM}} \sigma_M \frac{1}{\Delta} \left[ \lambda_{LF} \tilde{T} - \tilde{L} + (\beta \sigma_F + \gamma \sigma_R) \pi \right]
$$

(41)

The increase in $\pi$ will necessarily decrease $\tilde{M}$ so that the resource-based
industrialization policy brings about Dutch disease. (41) shows, however, that
the increases in capital and labor have positive effect on the production of
manufacturing product, then these would supplement that policy. Capital can
be imported from outside, even if we cannot control the rate of population
growth. In the case where we expect the capital increase, the damages of
Dutch disease would be smaller, the larger is the share of capital income in
manufacturing sector (the smaller is the share of labor income in the same
sector). In some cases the production of manufactured good would be in-
creased depending on the relative magnitude between the amount of capital increase and the degree of resource-based industrialization policy.

What would happen in the $F$ sector by resource-based industrialization policy?

\[
\hat{F} = \hat{T} - \frac{1}{\theta_{TF}} (\theta_{LR}\sigma_R + \theta_{LF}\theta_{TR}\sigma_F) \frac{1}{\Delta} (\lambda_{LF}\hat{T} + \lambda_{LM}\hat{K} - \hat{L} - \sigma_{M}\pi)
\]

\[
\frac{\partial \hat{F}}{\partial \pi} = \frac{a_{TM}(\theta_{LR}\sigma_R + \theta_{LF}\theta_{TR}\sigma_F)}{\Delta \theta_{TF}} > 0
\]

Being different from the case in section 2, the resource-based industrialization policy itself is successful. If we adopt capital import policy, however, to avoid Dutch disease, the increase in $K$ has the dampening effect on $\hat{F}$ so that the resource-based industrialization policy and non-Dutch disease policy might not be compatible with each other. The only solution to succeed both policies is to increase in labor power, which works positively on the production of both resource-based industry and manufacturing industry. The policy supporting population growth proposed by Dr. Mahathir in Malaysia can be justified in our model.

4. Conclusions and further research

Very few people insist on the resource-based industrialization as one of the most favorable development policy. It is considered as the strategy only in the early stage of industrialization. There are some cases where the export substitution strategy ended in failure. In these unsuccessful cases, however, the cause of the failure does not lie in the strategy itself, but the poor management of that strategy. As in Malaysia graduating from the stage of the resource-based industrialization, we have the case where over 50% of her exports now consists of industrial goods. It is the interesting question how she crossed the bridge between the resource-based industrialization and export promotion, and why some countries could but others could not. These questions have not been answered yet satisfactorily.

We considered the simple case of the resource-based industrialization. In fact the different kind of modification will influence the effectiveness of the policy; tariff escalation imposed by importing countries, economies of scale due to mass production, financing to carry out the policy, the roles of
multinational firms frequently observed in the case of mineral resource-based industrialization and the environment problem which thrusts itself forward all the time.