«Note»

A Two Region Model Applied to China National Accounts: Towards Vital Policies for Sustainable Growth

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Preface

This note intends to show the data and results of my paper (the same title as above) presented at the 8th China-Japan Symposium on Statistics, Guilin, China on 16th of Oct, 2004.

My paper depends on an endogenous growth model, which needs capital stock. This capital stock by country is difficult to obtain from current statistics and update.[1] It implies that it is difficult to estimate capital stock by country. Nevertheless, it is most essential to use capital stock (hereafter, capital) to measure the growth rates (including the rate of technological progress) in the real world and under convergence. My model as an endogenous growth model needs capital by country. My paper [IARIW, Aug, 2004] proposed a method for estimating capital, by studying the relationship among the initial values available in such statistics as International Financial Statistics, IMF, without relying on the perpetual inventory method. Of course, both methods should be compared with each other if possible.[2] My attention is that the value of capital by country should be reviewed and integrated from an economy as a whole.

For this paper, I have roughly estimated capital of China by year and used these values for vital policies derived from my model. If my estimation is appropriate, its capital-output ratio is already close to 2.0,[3] which implies that China is going into one of advanced

1) OECD, "Flows and Stocks of Fixed Capital," [1997] published capital stock for 1970–1995 by country. The Penn World Table (Mark 5) of Summers and Heston [1991] published the capital-labor ratio for 29 countries among 138 countries. Since then, there has been no statistics of capital stock.

2) I compared my results with those in Mark 5 (by calculating capital from the capital-labor ratio) and found that there were not so much differences between them.

3) The Japanese national accounts have published capital in detail by year for many years. I tested these values for the capital-output ratio by sector using my model and found that it may be better to exclude tangible non-producible assets (for connecting depreciation or the depreciation rate with capital, investment, and the growth rate of capital under convergence).

countries, as I clarified in the above paper. My suggestion is that any economy must control the capital-output ratio not to exceed 3.0. This means that any advanced country needs the balance between private and public investment and the balance of per capita output between seashore (H) and inland (F) regions.

For this adjustment, I aggregate two regions of an economy using my model based on the Cobb-Douglas production function, assuming that the relative price level is one: $Y=p \cdot Y_H+Y_F$. If we use two sets of $Y=p \cdot Y_H+Y_F$, this becomes the two-region model. The two-region model can be divided into two-regions, two-goods, two-sectors, and two-countries, by setting different assumptions.

In a strict two-region model, capital-goods output in one region should be equal to the sum of the increase in capital of both regions. I replace this restriction by assumptions.[4)] Instead, I stress, in this paper/note that how we can prolong the years when a high sustainable growth rate is maintained by shifting resources between two regions, seashore and inlands, together with allowed inequality of income per capita between two regions. My conclusion is that this is possible by grouping rich and poor provinces under several sub-groupings.

Finally, the initial values and parameters produce variables under both current and convergence situations. For variables under convergence, I have used both equations and recursive programming. This paper and note here only use each equations for both the current and convergence situations. This simplicity is convenient for absorbing the essence of the literature in international trade and expressing the results corresponding with the literature.

In short, this note shows a rough version of the two-region model using China, 2002, yet clarifies how an economy can maintain a sustainable growth rate by shifting the investment in one region to another and adjusting the capital-output ratio between two regions. The following note repeats the résumé of the paper, Guilin, but I do not secall my paper, 2003, that was postponed last fall.

1. Introduction

Is it possible for a country to maintain a sustainable growth? A sustainable growth implies that the rate of technological progress under convergence is con-

4) In my closed model, the difference between saving and investment is composed of banking costs. These costs include bad-debts. However, in my open economy the difference between saving and investment is equal to the sum of the balance of payment and capital transfers, net, which is divided into government and private sectors.

tinuously stable. This rate is essential in economic growth and based on human capital, yet how can this rate be measured? And, what are the conditions for sustainable growth? These conditions must be the upper limit of the capital-output ratio, the maximum difference of the rate of technological progress between seashore and inland regions, and a consistency of real assets with the role of financial assets or a permitted range of imbalance between real assets and the financial assets related to the central bank interest rate.

This paper intends to analyze the national accounts in China by region and clarifies vital requirements for sustainable growth which are hitherto unknown, not to repeat a similar misleading as seen in the Japanese economy after the 1990s. For this purpose, I develop a two region model, supported by the method for measuring capital (stock) [1] and the method for neutralizing the relationship between real and financial assets [2]. A two region model, which is the main issue in this paper, is based on my endogenous growth model [3, 4] under the current and convergence situations. I find that my endogenous growth model is applicable to each capital-goods and consumer-goods in the two region model by assuming that seashore region manufactures capital-goods and the inland region consumer-goods. I denote the H-region for capital-goods and the F-region for consumer-goods. If the difference of the rate of technological progress between these two regions is beyond a permitted magnitude, it is difficult to maintain sustainable growth since a soft-landing convergence cannot be guaranteed at a bubbled stage. In other words, any country, not only China but also India, Brazil, and Russia, cannot maintain its sustainable growth in the long-term unless it does not enlarge or do neutralize the above difference. In a word, poor people must be faster educated.

For a two region model applied to China, I need to confirm the theories of international trade between countries, in particular the Heckscher-Ohlin model, Rybczynski, the Stolper and Samuelson, and even Leontief paradox. I find a similarity for each framework of two regions, two commodities, two sectors, two countries, and the world, in particular, for the treatment of redistribution of resources including the balance between saving and investment. The two region model, for simplicity, assumes that total resources are fixed, where capital or labor of one region is shifted to that of the other region.

2. Methodologies to the two region model

Before starting, I confirm that there is no literature that theoretically measures the rate of technological progress under convergence. For example, according to Motoshige Ito [5], China looks for the quality of growth under excessive growth of capital. He points out that the growth rate of capital is 40% while the growth rate of output is 9%. What is the difference between these two rates, he asked. He concludes that not only China but also many countries must only enjoy capital growth without the increase in steady total factor productivity. Krugman's [1994] myth of Asia's miracle was tested later when Malaysia severely suffered from financial crisis in 1997, but similarly without measuring the rate of technological progress under both the current and theoretical situations.

Let me explain the process to lead to the two region model, with methodologies. For my previous paper [6], I calculated parameters and measured variables using China national accounts for 31 regions, but without introducing the role of financial assets and revealing urgent policies necessary for the central government to take. Kamiryo [2] integrated *beta* with both the limit of growth as shown by Penrose [1966] and Uzawa [1968] and the role of financial assets as shown by Freedman [1968], together with an empirical work on the unbalance between the corporate and the government & household sectors in Japan after the 1990s. Kamiryo [1] clarified, setting four clubs, a base for why poor countries could not get into such catching-up countries as China and India. The two region model is here now finalized, by using *beta* [4] totally related to structural reform and integrating the above methodologies. The value of *delta* is formulated only to neutralize diminishing returns in the model.

The two region model absorbed the ideas of Findley [1960] and Uzawa [1961, 1965] (for review, see Solow [1961]). The ratio of wages to rentals was already used in an open economy, whose original cases were shown as Eli Heckscher [1919], Bertil Ohlin [1933], Lerner [1933–34], Stolper and Samuelson [1941–42], Rybczynski [1955], and Ronald Jones [1961]. However, I stress here that the literature assumes constant cost (linear homogenous) technology. My model expresses variables under both zero and positive/negative technological progress by using *beta* that is directly related to investment in quality and is calculated using the equations in [4] under convergence: the lower is *beta*, the higher the rate of technological progress. The two region model here concentrates on the redistribution/shift of resources under the assumptions: (1) Aggregated/total values of national/regional accounts are fixed (in this sense, I do not cite the result of Rybczynski). (2) If the current value of capital or labor increases in one region, this value must be decreased in the other region to offset the increase in one region. (3) As shown by Stolper & Samuelson and Jones [1965], quantity (commodity outputs and factor endowments) is dual/reciprocal to quality (commodity prices and factor prices), which is true even under the above (1).

3. My research questions and replies

3.1 Each idea behind the three questions

Three research questions are: (1) Which is correct, the capital-labor ratio is higher in capital-goods (as shown in Uzawa [1961] or the capital-labor ratio is higher in consumer-goods (as shown in Findley [1960])? (2) Is the relative share of profit fixed/constant or not (as raised by Solow [1960])? (3) For sustainable growth, is it essential for the central government to shift net investment from one region to the other region?

For the above (1), the capital-labor ratio can be higher or lower in capital-goods, but the higher the capital-labor ratio in capital-goods the more effective is the execution of vital policies. And, the literature always uses the capital-labor ratio, but this ratio increases even under convergence and cannot be a final indicator. I use, instead, the capital-output ratio. This ratio will even be decreased after an economy is bubbled and/or beyond the limit of growth, as seen in the Japanese economy. I stress that the relationship between the capital-output ratio and *beta** under convergence is determined by the combination of such parameters as the growth rate of population/employed persons, the relative share of profit, the rate of saving or the rate of investment (after adjusting the balance of payment in an open economy).

For the above (2), the relative share of profit, α, is historically constant by country as shown by Kaldor [1978] and Charles Jones [1992]. However, the relative share of profit differs greatly by country and region, apart from the literature. This is important in that α is closely related to the rate of profit and, accordingly, the neutrality of financial assets to avoid assets-deflation and deflation [2]. One of assumptions in the two sector model raised by Uzawa and indicated by Solow is that the relative share of profit equals the rate of saving, but this golden assumption must be erased in the real world: e.g., the rate of saving/investment is 40% in recent China and the relative share of profit is less than 10%. My two region model holds without such assumption as the golden rule, free from any condition for the relative share of profit, the rate of profit, and the growth rate of output each under convergence, except for upper limit of the capital-output ratio. Note that in some seashore regions of China, the capital-output ratio suddenly approaches the limit of growth, although there is still enough room for avoiding its possibility using vital policies.

For the above (3), the shift of capital and/or labor is related to the redistribution of resources and plays an important role for sustainable growth. In this respect, we must learn the propositions set from international trade. If this shift is beyond the range of a soft-landing, convergence will be disturbed and thus we must take advantage of the different results of simulation. Conclusively speaking, human capital is significantly important and China can definitely use more human capital instead of physical capital since the quality of labor is attractive. The results are shown by the changes in *beta* under the current situation and $beta^*$ under convergence. Important economic policies are suggested: 1. Human capital accumulation should be accelerated through education, by taking advantage of a planned economy, in particular, for inland regions. Inland regions can accelerate capital-saving technology, which is a natural base for sustainable growth. 2. My model numerically expresses human capital using *beta* and $beta^*$.

3.2 How to structurally reply to the three questions

Then, how can I structurally reply to the above research questions? If I use both the relative share of profit that shows the elasticity of substitution and the relationship between the ratio of wages to rentals, w/r, and the labor-capital ratio, $1/k$, I can numerically show the whole picture behind the above each idea. Let me explain the structure of the elasticity of substitution (as the relative share of profit, α). The elasticity of substitution, α, was first discussed by Hicks [1932] and Lerner [1933–34] explained it using a diagram. Findley [1960] reviewed the distribution shares, citing the above two papers. I stress that Findley [1960] clarified a base of international trade, by illustrating the relationship between quantity (factor productivities) and quality (prices) using the elasticity of substitution. I pay attention to the changes in the relative share of profit, by applying my model to China 2002 data and its various cases that shift resources between two regions. The following facts are clarified from the above work.

1. Theoretically, if w/r and/or $1/k$ increase, the elasticity of substitution, α,

increases. The value of α does not change in the case of total region or commodity of a country, but this α differently changes in each region or commodity. I can now reply to Solow's [1958] suspicion about the empirical constancy of α in an economy.

2. In both total economy and its sub-economy by region, the value of w/r increases as an economy grows, where empirically wages increases and rentals reversely decreases. At the same time, the capital-labor ratio continuously increases (or, the labor-capital ratio continuously decreases). This implies that it is difficult for an economy to empirically increase α or decrease k under the increase in w/r.
3. In total economy and sub-economy, the capital-output ratio, Ω, has its upper limit, say, between 3.0 and 4.0. An economy after reaching this limit suffers from long difficult times as seen in the Japanese economy after the 1990s, resulting in a slower increase in the capital-labor ratio. The value of Ω only decreases by improving $beta^*$ and *beta*.

4. Empirical results

I will reply to my research questions applying China data of IFS/IMF to my two region model:

1. The level of capital-output ratio, Ω, depends on the relationship between capital, labor, and output by region. For instance, Ω in total China is 2.342 (on average) in 2002, when I estimate the capital-labor ratio from the above-mentioned structure of the elasticity of substitution. Total region is divided into (1) a higher Ω region (H-region) than average and (2) a lower Ω region (F-region) than average. The H-region assumes to produce capital-goods and F-region assumes consumption-goods, but this assumption can be reversed by adjusting the initial data. The shift of capital from the H-region to the F-region lowers Ω in the H-region and raises Ω in the F-region, under

the averaged Ω being unchanged: if $K_H(0)$ decrease by 20%, $\Omega_H(0)$ changes from 3.345 to 2.649 and $\Omega_F(0)$ changes from 1.950 to 2.220. This result is essentially good for sustainable growth in China.

2. The rate of technological progress and, accordingly, the growth rate of output under convergence, g_Y^*, differs by the level of the rate of saving or the investment ratio, i. The higher the investment ratio, the higher the growth rate: if i=0.1, g_Y^*=0.04 and if i=0.4, g_Y^*=0.14, where $beta^*$ is roughly 0.6–0.7. If $beta^*$=1 or under no technological progress, g_Y^*=0.04 regardless of the value of the net investment ratio. These results, to some extent, differ by the output-share of capital-goods and the level of the investment ratio.
3. In the above (3), it is better to shift capital or labor in one region to the other. And, in my two region model, similar to my two country model, I can basically confirm the propositions raised by Hecscher-Ohlin, Rypbcznski, (using the coefficients of capital and labor inputs) and Stolper-Samuelson (using prices of factor inputs and outputs) under respective conditions. Leontief's finding holds (not as a paradox) if the capital-saving industry (as traditionally used) is replaced by the human capital-augmented industry, where my endogenous growth model expresses human capital by the technology that uses the investment ratio and $beta^*$.
4. For the neutrality of financial assets in my model, I use the Penrose curve and the Penrose-shadow curve. These are related to both $beta^*$ and the central bank interest rate. According to Rypbcznski, both wages and rentals (i.e., the rate of profit) are respectively set equal by region (for this, I use goal seek in the Excel), but I only use the equal rentals for two regions to compare rentals with the central bank interest rate. If its imbalance between two regions is above a limit, the neutrality of financial assets is not guaranteed, resulting in assets-deflation/inflation.

5. Conclusions: towards vital economic policies

Finally, for China what economic policies are urgently required? For this, I summarize the values of the partial derivative of *beta** to the capital-output ratio, $\partial\Omega^* / \partial\beta^*$, using the equation [4, Eq. 22] under convergence. I calculate the values of $\partial\Omega^* / \partial\beta^*$, using China 2002 data, where I need to fix the three parameters of the investment ratio, i, the growth rate of population, n, and the relative share of profit, α. Generally, "the higher the *beta** the higher Ω^*," in particular, when *beta** is beyond 0.8, the value of $\partial\Omega^* / \partial\beta^*$ becomes rapidly higher and when *beta** is below 0.7, the value of $\partial\Omega^* / \partial\beta^*$ is slightly and linearly increasing as *beta** increases. It is strongly suggested that *beta** should be less than 0.9. Furthermore, I can now change the value of one parameter: e.g., $i=0.1$, $i=0.2$, $i=0.3$, and $i=0.4$, where the values of the partial derivative spread widely and accelerate the above tendency, depending on the role of each parameter under convergence. Thus, I can suggest useful economic policies by parameter and by combination of parameters.

1. For the change in the investment ratio, i: The **higher** the investment ratio the higher the value of $\partial\Omega^* / \partial\beta^*$.
2. For the change in the growth rate of population, n: The **lower** the growth rate of population the higher the value of $\partial\Omega^* / \partial\beta^*$.
3. For the change in the relative share of profit, α: The **lower** the relative share of profit the higher the value of $\partial\Omega^* / \partial\beta^*$.
4. For the change in the investment ratio=the relative share of profit (in the golden age): the **lower** the $i=\alpha$ the higher the value of $\partial\Omega^* / \partial\beta^*$.

Generally (except for $\Omega^*<1$), the lower the capital-output ratio the more sustainable is growth. Therefore, the above results suggest that the lower the investment ratio and the higher both the population growth and the relative share of profit the more sustainable growth. In the golden age, the higher $i=\alpha$ the more sustainable growth, without contradiction. I indicate here that the investment ratio is extremely high in the current China and if this ratio becomes lower the capital-output ratio must become unfortunately higher due to a higher β^{*}. In this respect, a soft-landing is delicate to manage.

Now dividing China as a whole into two regions, the above findings are really applicable to both regions and we must first keep in mind the following economic policies:

1. In seashore regions, the capital-output ratio is already beyond 2.0. This implies that the Chinese economic growth, as a whole, should be adjusted and lowered, apart from some shortages of resources. If the investment ratio is less than 20%, the situation will be stable. If it is 10%, the golden age is guaranteed, where $g_Y^{*}=r^{*}$. However, if the investment is suddenly lowered, the capital-output ratio will increase as seen from the derivative analysis. Thus, the decrease in the capital-output is only possible if both capital and consumer commodities are more human-capital oriented through education and R & D, decreasing *beta**. If China cannot control the capital-output ratio, sustainable growth will not be successful, similar to the Japanese economy after the 1990s.
2. Capital resources have recently been shifted from seashore regions to inland regions, but without accurate measurements. We can measure the structure of the elasticity of substitution (Figures 1 and 2) and the partial derivatives by the investment ratio between the capital-output ratio and *beta** (omit Figure 3). The difference of the capital-output ratio between seashore and inland regions should be within the ranges of the situation where the rate of profit under convergence is within 10% above the central bank interest rate (paying attention to the maximum limit of the role of financial assets).
3. If labor becomes more effective due to education, the difference of wages between seashore and inland can be allowed (apart from factor price equal-

ization theorem). However, it needs an assumption that the two region model holds: if the difference of wages is enlarged, the economy will beyond the limit of a soft-landing. In this sense, the effective cooperation between capital and labor is still urgent by region.

In short, China can neutralize diminishing returns by improving the quality of human capital. For inland regions, economies need physical capital for infra structure, yet both capital- and consumer-goods can be more capital-saving oriented. This ascertains the neutrality of financial assets and, accordingly, sustainable growth.

References: [1] "What Numerically Determines the Differences between Catching Up and Endless Poverty in African Countries?, Cork, Ireland (Procedures, IARIW, 22p.), *International Association for Research in Income and Wealth,* Aug 2004. [2] "Risk of Growth in My Endogenous Growth Model: Integrating the Penrose Curve with the Petersburg Paradox," *Modelling and Analysis of Safety and Risk in Complex Systems, International Scientific School Conference,* St. Petersburg, Russia (Procedures, ISSC, 16p.), June 2004. [3] "*Furthering the Role of Corporate Finance in Economic Growth*," The University of Auckland (PhD thesis), 129p., Nov 2003. [4] "Basics of An Endogenous Growth Model: the Optimum CRC* Situation and Conditional Convergence," *Journal of Economic Sciences* 7 (2), 51–80, Feb 2004. [5] Motoshige Ito, July 5, 2004, *Nikkei*, p. 24. [6] "Endogenous Growth in China National Accounts: for Lasting Stable Growth by Region," *Papers of the Research Society of Commerce and Economics*, 44 (1), 201–287, Sep 2003 (for data and ratios of national accounts in China in 1997–2001 using 31 regions, see the paper). [7] Oniki, H., and H. Uzawa, "Patterns of Trade and Investment in a Dynamic Model of International Trade," *Review of Economic Studies* 32 (1): 15–18, Jan, 1965.

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Contents of the tables in this note:

The following tables are divided into three parts:

(1) Tables 1 to 4 (T1-4): capital and/or labor **increase** under the situation that the capital-output ratio for capital-goods, Ω_H, is higher than that for consumption-goods, Ω_F, resulting in a higher increase in total output than the initial total output: $\Omega_H>\Omega_F$ and $Y>Y_{case1}$. **T4** introduces the relative price level, where $p=P_H/P_F$, resulting in the same levels of rents and wages in both capital- and consumption-goods regions.

(2) **Tables 5 to 11 (T5-11):** capital and/or labor **decrease** under the situation that the capital-output ratio for capital-goods, Ω_H, is higher than that for consumption-goods, Ω_F, maintaining the same total output as the initial total output: $\Omega_H>\Omega_F$ and $Y=Y_{case1}$. **T9-11** introduce the relative price level, where $p=P_H/P_F$, resulting in the same levels of rents and wages in both capital and consumption-goods regions.

(3) **Tables 12 to 16 (T12-16):** capital and/or labor **decrease** under the capital-output ratio for capital-goods, Ω_H, is lower than that for consumption-goods, Ω_F, maintaining the same total output as the initial total output: $\Omega_H<\Omega_F$ and $Y=Y_{case1}$. **T16** introduces the relative price level, but cannot result in the same values of rents and wages in both capital- and consumption-goods regions. This is because the capital-output ratio turns from a situation of $\Omega_H<\Omega_F$ to a situation of $\Omega_H>\Omega_F$, which finally violates the vital assumption of non-reversal of factor intensity approved in international trade theory.

I interpret the results of the above tables as follows:

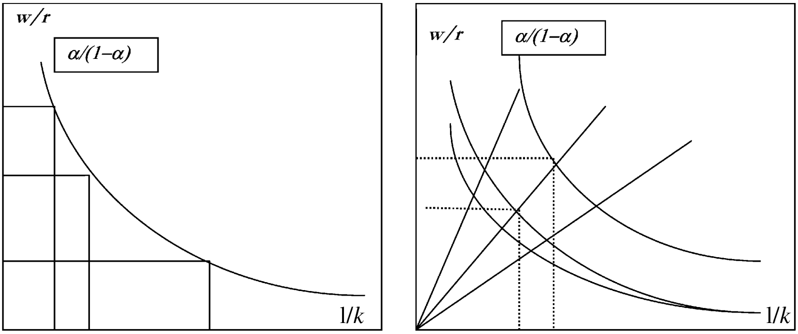
1. The two-region model in this note basically follows the framework, assumptions, and propositions found in international trade theory. However, these propositions were originally approved under fixed technology, exogenous growth or neutral technological progress. I measure endogenous changes in the rate of technological progress but these changes do not basically alter the above propositions and vividly clarify the relationship between variables. Also I find that there are some differences between two-regions, two-goods/commodities, two-countries, and two-sectors, but these differences can be solved using different assumptions (see below).

2. In this note, I pay attention to the shift of capital or labor between two regions under fixed total capital and labor (see T5-T16). This is most closely related to how to equalize poor and rich, but the purpose of this note is to clarify, by shifting resources, how to better maintain a sustainable steady growth under a given capital and labor. It is true that China can maintain a stable growth by gradually shifting resources between two regions, where each region implies the aggregate of provinces, seashore and inland.

3. The two-region model in this note does not use the recursive programming but equations derived from the initial given ratios/parameters. However, in both cases, the framework must solve "falling into circular calculation." For this, I watch the relationship between $(\Pi_H+W_H)+(\Pi_H>W_F)=\Pi+W=Y_{(hori.)}$ as a horizontal calculation and $Y_H+Y_F=Y_{(vert.)}$ as a vertical calculation. Usually, when a relative price level, $p=P_H/P_F$, is given under given Y_H and

Y_F, the value of $Y_{(hori.)}$ is not equal to the value of $Y_{(vert.)}$. The extent of this inequality depends on various combinations of the initial parameters. In order to obtain an equal relationship between, $Y_{(hori.)}$ and $Y_{(vert.)}$, we have to finally adjust the relationship using "goal seek" in the Excel. As results, the rent for capital-goods will be equal to the rent for consumption-goods and, at the same time, the wage rate for capital-goods will be equal to the wage rate for consumption-goods. This corresponds with factor price equalization theorem of Hecksher-Ohlin-Stolper-Samuelson (or Rybczynski as reciprocity relation). If this theorem does not hold, we must confirm the existence of the reversal of factor intensity. Empirically, I find that it is much easier to approach $Y_{(hori.)}=Y_{(vert.)}$ under a stable condition of $\Omega_H>\Omega_F$. In this respect, I prefer Uzawa [1961] that insists on the condition of $\Omega_H>\Omega_F$ to Findlay [1965] that violates the condition of $\Omega_H>\Omega_F$.

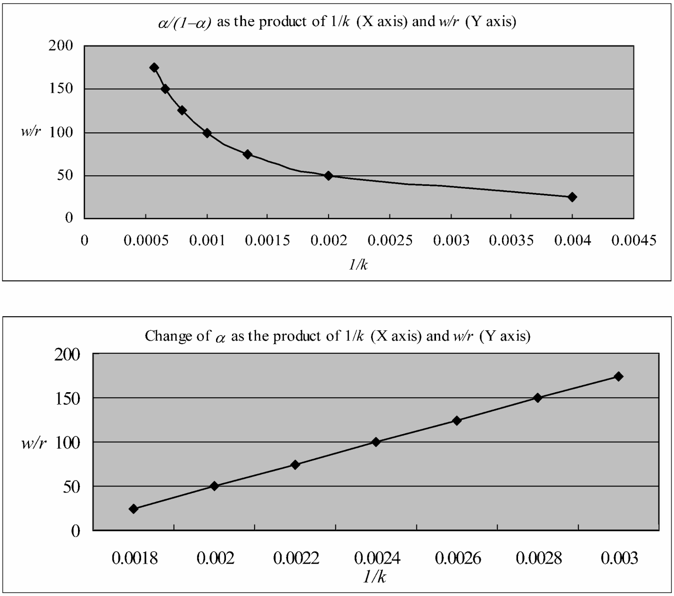
4. In the two-region model of this note, we can compare the results under $Y>Y_{(\mathrm{case1})}$ of T1 to T4 with the results under $Y=Y_{(\mathrm{case1})}$ of T5 to T16. The two region-model usually holds under $Y=Y_{(\mathrm{case1})}$, but in international trade theorem a condition of $Y>Y_{(\mathrm{case1})}$ must be used. Nevertheless, we can solve the relationship between these two different cases by setting some assumptions related to saving and investment, each net. In international trade theorem, the difference between saving and investment is equal to the balance of payment, which in turn is equal to the sum of the difference between private saving and investment and the difference between public/government saving and investment (as budget surplus or deficit). For T 11 and T12, I show this framework, and for other tables, I neglect the difference between saving and investment under an assumption that the difference between ΔY_H that produces capital-goods and $\Delta K=\Delta K_H+\Delta K_F$ as the total net investment for both capital-goods and consumption-goods will be absorbed by foreign trade (exports and imports including services) or internal trade. Note that the idea of $\Delta Y_H = \Delta K=\Delta K_H+\Delta K_F$ comes from Uzawa [1961]. In the future I must reformulate Oniki and Uzawa [1965] in continuous time to the two-region model in discrete time, clarifying the differences.



Elasticity of substitution is constant, where each rectangle shows the same area (see Findley [1960, p. 168].

Elasticity of substitution increases as w/r and/or $1/k$.
If r/w is used, $1/k$ is replaced by k.

Figure 1 The relationship between the ratio of wages to rentals, w/r, and the labor-capital ratio, $1/k$



Note: The higher the rate of wages to rentals, w/r, the higher the capital-labor ratio, which in turn increases the capital-output ratio. It is strongly suggested that capital should be shifted from physical to human capital.

Figure 2 The structure of the elasticity of substitution

Appendix A The relationship between the relative price level, the wage rate, and the rental

The price of capital-oriented goods, P_H: $P_H = a_{KH} \cdot r + a_{LH} \cdot w$. (1)

The price of labor-oriented goods, P_F: $P_F = a_{KF} \cdot r + a_{LF} \cdot w$. (2)

Where, a_{KH} and a_{LH} are each capital and labor per one unit of output in the capital-oriented goods region, and a_{KF} and a_{LF} are each capital and labor per one unit of output in the capital-oriented goods region.

A common rental (the rate of profit) is shown by r and a common wage rate is shown by w.

The above equations come from Stolper-Samuelson [1941] and Ronald Jones [1965].

The common rates of r and w are each shown as:

$$r = \frac{P_H + w / y_H}{\Omega_H} = \frac{P_F - w / y_F}{\Omega_F} \text{ and } w = y_F (P_F - \Omega_F \cdot r) = y_H P_H - \Omega_H \cdot r.$$

Therefore, $$r = \frac{y_F \cdot P_F - y_H \cdot P_H}{\Omega_F \cdot y_F - \Omega_H \cdot y_H} = \text{or } r = \frac{(y_F / y_H) P_F - P_H}{\Omega_F (y_F / y_H) - \Omega_H}. \quad (3)$$

And $$w = \frac{y_H \cdot y_F (\Omega_H \cdot P_F - \Omega_F \cdot P_H)}{\Omega_H \cdot y_H - \Omega_F \cdot y_F} = \text{or } w = \frac{P_H - P_F \cdot \Omega_H / \Omega_F}{1 / y_H - (\Omega_H / \Omega_F) y_F}. \quad (4)$$

Interesting to say, both Eq. 1 and Eq. 2 become one in my model. The relative price level, p, is defined as P_H/P_F.

Then, $p \equiv \frac{P_H}{P_F} = \frac{1}{1} = 1$ holds, when we add related values of the capital-oriented goods region/sector to those of the labor-oriented goods region/sector. Therefore, it is allowed to aggregate two sets of the Cobb-Douglas production functions: $Y_{Total} = Y_H + Y_F$ or $y_{Total} = y_H + y_F$.

Appendix B-1 The relationship between the rate of technological progress under the current and convergence situations (Kamiryo, [3, 4]; Kamiryo and Fujumoto [2005])

The current/actual rate of technological progress: $g_{A(a)} = g_{Y(a)} - \alpha \cdot g_{K(a)} - (1-\alpha)n$. (5)

The rate of technological progress under convergence: $g_A(t) = i_A \cdot k(t)^{\alpha-\delta}$, where $\alpha=\delta$. (6)

The current/actual structural reform parameter: $\beta_{actual(\delta>\alpha)} = 1-(g_{A(a)} \cdot k(0)^{\delta-\alpha})/i$. (7)

The parameter to neutralizing diminishing: $\delta = \dfrac{LN(i(1-\beta_a)/g_{A(a)})}{LN(k(0))} + \alpha$. (8)

Or, $\delta = \dfrac{n + \alpha(i - i \cdot \beta^* - n)}{i(1-\beta^*)}$, which is equal to Eq. 8. (9)

Appendix B-2 For the neutrality of financial assets and the estimation of capital stock (Kamiryo, [1],[2]):

$\alpha = k(0)\, x_0 = \Omega(0)\, (c_{CB} \cdot r_{CB})$, where $r(0)=r^* = c_{CB} \cdot r_{CB}$. (10)

$k_e^* = \alpha / x_e^*$, under convergence, where $k_e^* = \Omega^{*\frac{1}{1-\alpha}} = \Omega(0)^{\frac{1}{1-\alpha}}$. (11)

If $k(0)/k_e^*$ is compared with x_0 / x_e^*, $\dfrac{k(0)}{k_e^*} \cdot \dfrac{x_0}{x_e^*} = 1$ or $\dfrac{k(0)}{k_e^*} = \dfrac{x_e^*}{x_0}$ holds. (12)

Appendix B-3 For the relationship between depreciation, the depreciation rate, capital, investment, and the growth rate of capital under convergence (Kamiryo, [1]):

I set up a new concept for investment: net investment instead of gross investment. Text-books use gross investment and, accordingly, the growth rate of gross investment to capital. I raise a question: Capital (stock) is one after deducting depreciation and gross investment is used. How can these two be integrated? The literature uses a basic formula (see D. W. Jorgenson and Z. Griliches [1967, Eq. 14 on page 277]):

$K_{t+1} = I_t + (1-\delta)\, K_t.$ (13)

This investment is gross and its depreciation begins from the next year. As a result, for example, the speed of convergence by Barro and Sala-i-Martin [1995] is shown as $\beta = (1 - \alpha)(x + n + \delta)$. However, in national accounts saving is used for investment, but depreciation (capital consumption) is included in gross domestic products while saving and consumption constitute national income or disposable income. My model uses disposable income/output, where saving cannot include depreciation: the sum of saving and depreciation corresponds with gross investment. My new concept, net investment, assumes that depreciation immediately begins in the same year when investment occurs. Thus, the above equation is replayed, using the depreciation rate,

$$\delta_{DEP} = D_{EP} /(I_{t(gross)} + K_t), \text{ or depreciation, } D_{EP} = \delta_{DEP} (I_{t(gross)} + K_t), \tag{14}$$

by the following equations: $I_{t(net)} \equiv I_{t(gross)} - D_{EP}$ and, $K_{t+1} = I_{t(gross)} - D_{EP} + K_t$, (15)

where $D_{EP} \neq \delta_{EP} \cdot K_t$ or all the fixed assets including new investment are depreciated. This rate is new and consistent with a net concept of investment which I need. This rate differs, for convenience, from such depreciation rate of the text-books equation as $\delta = D_{EP} /K_t$, where gross investment is not included. Then I assume that the depreciation rate is equal to the growth rate of capital under convergence. This implies that the faster the technological progress the higher the depreciation rate since the growth rate of capital is almost equal to the growth rate of technological progress under convergence.

In both cases, gross and net investment, depreciation or the depreciation rate must be given in advance. Thus, a tentatively given depreciation rate is adjusted in my model after measuring the growth rate of capital so that both rates are almost the same. These problems are discussed in a separate paper comparing many countries each other.

Finally, the growth rate of capital is shown as $g_{Kt} = (K_{t+1}) - K_t)/K_t$, where capital, both K_{t+1} and K_t, are after depreciation even under convergence.

T1 Case 1. Both regions have different rates of profit and the wage rates **Y(0) up with p=1**

Country=capital-goods+consumption-goods: T=H+F							6144			$A(0)=k(0)^{1-\alpha}/\Omega(0)$
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	8500	295	197	492	5652	6144	2464	2169	4.0817
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08000	1.38346	0.05782	6.5642	4.7448	0.40105	0.6000	0.37085	0.04800	0.35305	4.3652
H: capital-goods			s=S/Y	0.40105	0.26068	0.14037		0.44115		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_H(0) \neq \Delta K($	S(0)	$S_H(0)$	A(0)
0.00755	90.64	3500.00	89.69	38	128.13	793.42	921.55	1087.01	997.32	6.1175
α	Ω(0)	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.13903	3.79797	0.03661	38.6130	10.1668	1.17955	0.7000	1.19891	0.09732	1.08223	8.7532
F: consumption-goods			c=1-s	0.59895						
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1204.26	5000.00	205.22	158.17	363.38	4859.07	5222.45	1377.02	1171.80	3.9277
α	Ω(0)	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.06958	0.95740	0.07268	4.1519	4.3367	0.26367	0.5647	0.23356	0.03930	0.22438	4.0349
Cases correspond with Hecksher-Ohlin by region.							$Y_{H(0)}/Y_{F(0)}$	0.17646	Uzawa [1962]: $\Omega_H > \Omega_F$	

1. Basic variables and parameters under convergence

		$g_Y{}^*=g_K{}^*$	$g_A{}^*$	$g_y{}^*$	Ω^*	r^*	i	$\beta^*_{(\delta=\alpha)}$	n	α
Case 1.	Total	0.1469	0.1272	0.1383	1.3835	0.0578	0.33044	0.6150	0.00755	0.08000
H: capital-goods		0.2084	0.1716	0.1993	3.7980	0.0366	0.96311	0.8218	0.00755	0.13903
F: consumption-goo		0.1200	0.1039	0.1116	0.9574	0.0727	0.21880	0.5252	0.00755	0.06958
Case 2.	Total	0.1370	0.1175	0.1285	1.5447	0.0555	0.32913	0.6430	0.00755	0.08572
H: capital-goods		0.2173	0.1720	0.2082	4.7397	0.0366	1.20190	0.8569	0.00755	0.17351
F: consumption-goo		0.0934	0.0793	0.0852	0.9574	0.0727	0.16870	0.5301	0.00755	0.06958
Case 3.	Total	0.1423	0.1238	0.1337	1.2821	0.0578	0.30622	0.5957	0.00755	0.07414
H: capital-goods		0.1847	0.1421	0.1758	3.5667	0.0537	0.80072	0.8225	0.00755	0.19146
F: consumption-goo		0.1246	0.1100	0.1162	0.8852	0.0607	0.22031	0.5008	0.00755	0.05375

2. Basic variables and parameters under the current situation *(delta>alpha)*

		$g_{Y(a)}$	$g_{K(a)}$	$g_{A(a)}$	$g_{y(a)}$	*delta*	$\beta_{actual\ (\delta>\alpha)}$	$\beta^*-\beta$	$k(0)$	$y(0)$
Case 1.	Total	0.0800	0.3000	0.0491	0.0718	0.0890	0.84900	-0.2340	6.5642	4.7448
H: capital-goods		0.0400	0.4000	0.0255	0.0322	0.0704	0.97943	-0.1576	38.6130	10.1668
F: consumption-goo		0.0108	0.1039	-0.0034	0.0032	0.0956	1.01633	-0.4911	4.1519	4.3367
For min capital good growth			0.0578							
Case 2.	Total	0.0800	0.3000	0.0474	0.0718	0.0874	0.85554	-0.2125	7.3751	4.7745
H: capital-goods		0.0400	0.4000	-0.0356	0.0322	0.0424	1.01775	-0.1609	50.1969	10.5908
F: consumption-goo		0.0081	0.1120	-0.0067	0.0006	0.1037	1.04158	-0.5115	4.1519	4.3367
Case 3.	Total	0.0800	0.3000	0.0508	0.0718	0.0907	0.82920	-0.2335	6.0057	4.6844
H: capital-goods		0.0400	0.4000	-0.0427	0.0322	-0.0134	1.02522	-0.2027	38.6130	10.8260
F: consumption-goo		0.0048	0.1044	-0.0079	-0.0027	0.0961	1.03804	-0.5372	3.7745	4.2641

$g_{A(a)}=g_{Y(a)}-\alpha g_{K(a)}-(1-\alpha)n$ delta=(n+α(i-iβ*-n))/(i(1-β*)) $\beta_{actual(\delta>\alpha)}=1-((1/i)(g_{A(a)}k(0)^{(\delta-\alpha)})$

3. Relationships between quantities: K_H & K_F and L_H & L_F

$K=(a_{KH} \cdot y_H)L_H+(a_{KF} \cdot y_F)L_F$

$L=(a_{LH} \cdot y_H)L_H+(a_{LF} \cdot y_F)L_F$

Heckscher-Ohlin

$K=a_{KH} \cdot Y_H+a_{KF} \cdot Y_F$

$L=a_{LH} \cdot Y_H+a_{LF} \cdot Y_F$

For K,	$a_{KH}=\Omega_H$ $a_{KF}=\Omega_F$			y_H	$a_{LH}=1/y_H$				
For L,	$a_{LH}=1/y_H$ $a_{LF}=1/y_F$	$a_{KH}=\Omega_H$	$a_{KF}=\Omega_F$	y_F	$a_{LF}=1/y_F$	L_H & L_F	Y_H & Y_F	$K=K_H+K_F$	$L=L_H+L_F$
Case 1.	Total	1.3835		4.7448	0.21076	1295	6144	8500	1295
	H: capital-goods	3.7980		10.1668	**0.09836**	90.64	921.55	3500	91
	F: consumption-goods		0.9574	4.3367	**0.23059**	1204.26	5222.45	5000	1204
Case 2.	Total	1.5447		4.7745	0.20945	1295	6182	9550	1295
	H: capital-goods	4.7397		10.5908	**0.09442**	90.64	959.98	4550	91
	F: consumption-goods		0.9574	4.3367	**0.23059**	1204.26	5222.45	5000	1204
Case 3.	Total	1.2821		4.6844	0.21348	1415	6630	8500	1415
	H: capital-goods	3.5667		10.8260	**0.09237**	90.64	981.30	3500	91
	F: consumption-goods		0.8852	4.2641	**0.23451**	1324.68	5648.61	5000	1325

T1 Case 2. K increases in capital-goods by 30% **Uzawa [1962]**

Country=capital-goods+consumption-goods: T=H+F						6182	$\Delta Y(0)/Y(0)$	0.00626	$A(0)=k(0)^{1-\alpha}/\Omega(0)$	
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9550	318	212	530	5652	6182	2464	2146	4.0229
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08572	1.54470	0.05549	7.3751	4.7745	0.39855	0.6000	0.36594	0.05143	0.34712	4.3652
H: capital-goods			$\Delta K/K$:	0.3	0.3		$\Delta Y_{H(0)}/Y_{H(0)}$	0.04171		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	90.64	4550.00	116.60	50	**166.57**	793.42	959.98	1413.11	1296.52	5.3684
α	Ω(0)	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.17351	4.73966	**0.03661**	50.1969	10.5908	1.47202	0.7000	1.53727	0.12146	1.35056	8.7532
F: consumption-goods							$\Delta Y_{F(0)}/Y_{F(0)}$	0.00000		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1204.26	5000.00	201.37	162.01	363.38	4859.07	5222.45	1050.92	849.54	3.9277
α	Ω(0)	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.06958	0.95740	0.07268	4.1519	4.3367	0.20123	0.5542	0.16920	0.03856	0.16267	4.0349
							$Y_{H(0)}/Y_{F(0)}$	0.18382		

4. The Penrose curve, B_K, and the assets valuation ratio, v

	Ω*	I/K	g_K*	Slope B_K	r*	r_{M*}	Slope A	Slope B_K/A	$v=1/\beta^*$
Case 1. Total	1.3835	0.2388	0.1469	1.6261	0.0578	0.0356	1.6261	1.0000	1.6261
H: capital-goods	3.7980	0.2536	0.2084	1.2168	0.0366	0.0301	1.2168	1.0000	1.2168
F: consumption-goo	0.9574	0.2285	0.1200	1.9039	0.0727	0.0382	1.9039	1.0000	1.9039
Case 2. Total	1.5447	0.2131	0.1478	1.4420	0.0620	0.0430	1.4420	1.0000	1.5551
H: capital-goods	4.7397	0.2536	0.2168	1.1698	0.0366	0.0313	1.1698	1.0000	1.1671
F: consumption-goo	0.9574	0.1762	0.1200	1.4679	0.0727	0.0495	1.4679	1.0000	1.8866
Case 3. Total	1.2821	0.2388	0.1460	1.6359	0.0536	0.0328	1.6359	1.0000	1.6787
H: capital-goods	3.5667	0.2245	0.2214	1.0139	0.0537	0.0529	1.0139	1.0000	1.2158
F: consumption-goo	0.8852	0.2489	0.1182	2.1065	0.0607	0.0288	2.1065	1.0000	1.9967

5. The relative price level: real vs. nominal

	r(0)	$r=\partial Yt/\partial Kt$	$P_Y=r(0)/r_{real}$	(a) $r_{M(0)\ given}$	Inf. or def $p_Y=r_{M(0)}/r_{rea}$	(b) r_M* at β*	(a)/(b)	(c) r_{CB} goal see	(a)/(c)
Case 1. Total	0.05782	0.05782	1.0000	0.0330	0.5707	0.0356	0.9280	0.0228	1.4462
H: capital-goods	0.03661	0.03661	1.0000	0.0330	0.9014	0.0301	1.0969	0.0173	1.9064
F: consumption-goo	0.07268	0.07268	1.0000	0.0330	0.4541	0.0382	0.8645	0.0261	1.2647
Case 2. Total	0.05549	0.05549	1.0000	0.0330	0.5947	0.0398	0.8283	0.0228	1.4462
H: capital-goods	0.03661	0.03661	1.0000	0.0330	0.9014	0.0314	1.0520	0.0245	1.3477
F: consumption-goo	0.07268	0.07268	1.0000	0.0330	0.4541	0.0385	0.8566	0.0214	1.5394
Case 3. Total	0.05782	0.05782	1.0000	0.0330	0.5707	0.0319	1.0338	0.0287	1.1511
H: capital-goods	0.05368	0.05368	1.0000	0.0330	0.6148	0.0442	0.7474	0.0245	1.3477
F: consumption-goo	0.06073	0.06073	1.0000	0.0330	0.5434	0.0304	1.0851	0.0236	1.3969

Note: If the price level of output, P_Y, is one, real=nominal and the elasticity of substitution, σ, is always 1.0.

$r(real)=\partial Yt/\partial Kt=\alpha AtKt^{\wedge\alpha-1}Lt^{1-\alpha}$ and $w(real)=\partial Yt/\partial Lt=(1-\alpha)AtKt^{\alpha}Lt^{-\alpha}$

6. Relationships between price levels: r_H & w_H for P_H and r_F & w_F for P_F **Rybczynski**

For H, $P_H=a_{KH}.r_H+a_{LH}.w_H$ When real=nominal, the price level is 1.0. The elasticity of substitution is 1.0.

For F, $P_F=a_{KF}.r_F+a_{LF}.w_F$

		r_H	r_F	w_H	w_F	P_H	P_F	$p=P_H/P_F$
Case 1.	Total							
	H: capital-goods	0.03661		8.7532		1		1
	F: consumption-goods		0.07268		4.0349		1	
Case 2.	Total							
	H: capital-goods	0.03661		8.7532		1		1
	F: consumption-goods		0.07268		4.0349		1	
Case 3.	Total							
	H: capital-goods	0.05368		8.7532		1		1
	F: consumption-goods		0.06073		4.0349		1	

T1 Case 3. L increases in consumption-goods by 10% **Uzawa [1962]**

Country=capital-goods+consumption-goods: T=H+F						6630	$\Delta Y(0)/Y(0)$	0.07909	$A(0)=k(0)^{1-\alpha}/\Omega(0)$	
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1415	8500	295	197	492	6138	6630	2464	2169	4.1014
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.07414	1.28207	0.05782	6.0057	4.6844	0.37165	0.6000	0.34240	0.04448	0.32717	4.3371
H: capital-goods							$\Delta Y_{H(0)}/Y_{H(0)}$	0.06484		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	90.64	3500.00	131.52	56	187.88	793.42	981.30	949.31	817.79	5.3786
α	Ω(0)	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.19146	3.56670	0.05368	38.6130	10.8260	0.96740	0.7000	0.96235	0.13402	0.83338	**8.7532**
F: consumption-goods			ΔL/L:	0.1		0.1	$\Delta Y_{F(0)}/Y_{F(0)}$	0.08160		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1324.68	5000.00	163.39	140.24	303.63	5344.98	5648.61	1514.72	1351.33	3.9703
α	Ω(0)	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.05375	0.88517	0.06073	3.7745	4.2641	0.26816	0.5381	0.24636	0.02893	0.23923	**4.0349**
Using goal seek, where w_F approaches $w=w_H$							$Y_{H(0)}/Y_{F(0)}$	0.17372		

7. The neutrality of financial assets and the coeffcient *x=r/w* $ke^*=\Omega^*$^(1/(1−α)) $x_e^*/x_0=k(0)/ke^*$

	r_{CB} goal see	r_M^* at β^*	r^*/r_{M^*}	$c_{CB}=r_M^*/r_{CB}$	α_x	$x_0=\alpha_x/k(0$	ke*	$x_e^*=\alpha_x/ke^*$	x_0/x_e^*
Case 1. Total	0.0228	0.0356	1.6261	1.55842	0.0870	0.0132	1.4231	0.0611	0.2168
H: capital-goods	0.0173	0.0301	1.2168	1.73793	0.1615	0.0042	4.7113	0.0343	0.1220
F: consumption-goo	0.0261	0.0382	1.9039	1.46297	0.0748	0.0180	0.9543	0.0784	0.2298
	goal seek			**goal seek**	$\alpha_x=\alpha/(1-\alpha)$				
Case 2. Total	0.0228	0.0398	1.4420	1.88294	0.0938	0.0127	1.6090	0.0583	0.2182
H: capital-goods	0.0245	0.0314	1.1698	1.27800	0.2099	0.0032	6.5707	0.0320	0.1007
F: consumption-goo	0.0214	0.0385	1.4679	2.30949	0.0748	0.0180	0.9543	0.0784	0.2298
Case 3. Total	0.0287	0.0319	1.6359	1.14262	0.0801	0.0145	1.3078	0.0612	0.2365
H: capital-goods	0.0245	0.0442	1.0139	2.16224	0.2368	0.0042	4.8199	0.0491	0.0851
F: consumption-goo	0.0236	0.0304	2.1065	1.22026	0.0568	0.0198	0.8791	0.0646	0.3066

Note: When the effective labour is used, the coefficient, x_0 and x_e, are connected with *ke*(0) (see also below).

8. Data for the Heckshe-Ohlin, Rybczynski, the Stolper-Samuelson, and Leontief paradox

p$=P_M/P_F=1$	k(0)	Δk/k(0)		*sigma*	w(0)=w(re	w(0)/r(0)	r(0)/w(0)	k/(w/r)	α_x(w/r)
Case 1. Total	6.5642		(Δ(w/r)/(w/r)		4.3652	75.49	0.0132	0.0870	6.5642
H: capital-goods	38.6130	0.0000	0.0000	#DIV/0!	8.7532	239.11	0.0042	0.1615	38.6130
F: consumption-goo	4.1519	0.0000	0.0000	#DIV/0!	4.0349	55.52	0.0180	0.0748	4.1519
								=α/(1-α)=α_x	=k(0)
Case 2. Total	7.3751				4.3652	78.66	0.0127	0.0938	7.3751
H: capital-goods	50.1969	0.3000	(0.0000)	#######	8.7532	239.11	0.0042	0.2099	50.1969
F: consumption-goo	4.1519	0.0000	0.0000	#DIV/0!	4.0349	55.52	0.0180	0.0748	4.1519
Case 3. Total	6.0057				4.3371	75.00	0.0133	0.0801	6.0057
H: capital-goods	38.6130	0.0000	(0.3180)	0.0000	8.7532	163.06	0.0061	0.2368	38.6130
F: consumption-goo	3.7745	-0.0909	0.1968	0.4619	4.0349	66.44	0.0151	0.0568	3.7745

Note: When the effective labour is used, the current wage rate and the profit rate are connected with *k*(0).

Rybczenski [1955] only holds under the condition of H-O.

9. Introduction of relative price level, *p* = *P*$_H$/*P*$_F$: Duality [Jones, R. W., 1965] **S-Samuelson [1941]**

$r_F=r_F(0)=\partial Y_F/\partial K_F$ $r_H(0)_{nominal}=\mathbf{p}\cdot(\partial Y_H/\partial K_H)$, where **p**$=P_H/P_F$ $w_F=w_F(0)=\partial Y_F/\partial L_F$ $w_{H(0)nominal}=\mathbf{p}\cdot(\partial Y_H/\partial L_H)$

	Marginal productivity	$r_{H(marg.pro.)}$	$r_{F(margi.Pro.)}$	$w_{H(margi.Pro.)}$	$w_{F(matgi.pro.)}$	P_H	P_F	$\mathbf{p}=P_H/P_F$	Changes (%)
Case 1.	Total	0.05782		4.3652					for r & w
	H: capital-goods	0.03661		8.7532		1		1.00000	1.0000
	F: consumption-goods		0.07268		4.0349		1		1.4664
Case 2.	Total	0.05549		4.3652					1.0000
	H: capital-goods	**0.03661**		8.7532		1		1.00000	0.8356
	F: consumption-goods		0.07268		4.0349		1		1.0000
Case 3.	Total	0.05782		4.3371					1.0000
	H: capital-goods	0.05368		8.7532		1		1.00000	1.0000
	F: consumption-goods		0.06073		**4.0349**		1		1.0000

T2 Case 1. Both regions have different rates of profit and the wage rates **Y(0) up with p=1**

Country=capital-goods+consumption-goods: T=H+F 6144 $A(0)=k(0)^{1-\alpha}/\Omega(0)$

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	8500	295	197	492	5652	6144	2464	2169	4.0817
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08000	1.38346	0.05782	6.5642	4.7448	0.40105	0.6000	0.37085	0.04800	0.35305	4.3652
H: capital-goods			s=S/Y	0.40105	0.26068	0.14037		0.44115		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_H(0)\neq\Delta K($	S(0)	$S_H(0)$	A(0)
0.00755	90.64	3500.00	89.69	38	128.13	793.42	921.55	1087.01	997.32	6.1175
α	Ω(0)	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.13903	3.79797	0.03661	38.6130	10.1668	1.17955	0.7000	1.19891	0.09732	1.08223	8.7532
F: consumption-goods			c=1-s	0.59895						
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1204.26	5000.00	205.22	158.17	363.38	4859.07	5222.45	1377.02	1171.80	3.9277
α	Ω(0)	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.06958	0.95740	0.07268	4.1519	4.3367	0.26367	0.5647	0.23356	0.03930	0.22438	4.0349

Cases correspond with Hecksher-Ohlin by region. $Y_{H(0)}/Y_{F(0)}$ 0.17646 **Uzawa [1962]:** $\Omega_H>\Omega_F$

1. Basic variables and parameters under convergence

		$g_Y{}^*=g_K{}^*$	$g_A{}^*$	$g_y{}^*$	Ω^*	r^*	i	$\beta^*{}_{(\delta=\alpha)}$	n	α
Case 1.	Total	0.1469	0.1272	0.1383	1.3835	0.0578	0.33044	0.6150	0.00755	0.08000
H: capital-goods		0.2084	0.1716	0.1993	3.7980	0.0366	0.96311	0.8218	0.00755	0.13903
F: consumption-goo		0.1200	0.1039	0.1116	0.9574	0.0727	0.21880	0.5252	0.00755	0.06958
Case 2.	Total	0.1332	0.1137	0.1247	1.6133	0.0546	0.32859	0.6539	0.00755	0.08809
H: capital-goods		0.2692	0.2236	0.2597	3.7980	0.0366	1.24620	0.8206	0.00755	0.13903
F: consumption-goo		0.0817	0.0677	0.0736	1.2318	0.0643	0.16834	0.5976	0.00755	0.07919
Case 3.	Total	0.1461	0.1267	0.1375	1.3658	0.0578	0.32622	0.6117	0.00755	0.07898
H: capital-goods		0.1815	0.1420	0.1726	3.2999	0.0537	0.74083	0.8083	0.00755	0.17714
F: consumption-goo		0.1304	0.1148	0.1219	0.9685	0.0607	0.24105	0.5239	0.00755	0.05881

2. Basic variables and parameters under the current situation (*delta>alpha*)

		$g_{Y(a)}$	$g_{K(a)}$	$g_{A(a)}$	$g_{y(a)}$	*delta*	$\beta_{actual\ (\delta>\alpha)}$	$\beta^*-\beta$	$k(0)$	$y(0)$
Case 1.	Total	0.0800	0.3000	0.0491	0.0718	0.0890	0.84900	-0.2340	6.5642	4.7448
H: capital-goods		0.0400	0.4000	0.0255	0.0322	0.0704	0.97943	-0.1576	38.6130	10.1668
F: consumption-goo		0.0108	0.1039	-0.0034	0.0032	0.0956	1.01633	-0.4911	4.1519	4.3367
For min capital good growth			0.0578							
Case 2.	Total	0.0800	0.3000	0.0467	0.0718	0.0862	0.85844	-0.2045	7.7226	4.7869
H: capital-goods		0.0400	0.4000	-0.0221	0.0322	0.0863	1.01464	-0.1941	38.6130	10.1668
F: consumption-goo		0.0115	0.1063	-0.0039	0.0039	0.0980	1.02391	-0.4263	5.3975	4.3819
Case 3.	Total	0.0800	0.3000	0.0494	0.0718	0.0893	0.84575	-0.2340	6.5186	4.7726
H: capital-goods		0.0400	0.4000	-0.0371	0.0322	0.0094	1.02754	-0.2193	35.1027	10.6375
F: consumption-goo		0.0078	0.1027	-0.0054	0.0002	0.0944	1.02350	-0.4996	4.1519	4.2870

$g_{A(a)}=g_{Y(a)}-\alpha g_{K(a)}-(1-\alpha)n$ delta=(n+α(i-iβ*-n))/(i(1-β*)) $\beta_{actual(\delta>\alpha)}=1-((1/i)(g_{A(a)}k(0)^{\wedge}(\delta-\alpha))$

Heckscher-Ohlin

3. Relationships between quantities: K_H & K_F and L_H & L_F

$K=(a_{KH}\cdot y_H)L_H+(a_{KF}\cdot y_F)L_F$ $L=(a_{LH}\cdot y_H)L_H+(a_{LF}\cdot y_F)L_F$

$K=a_{KH}\cdot Y_H+a_{KF}\cdot Y_F$ $L=a_{LH}\cdot Y_H+a_{LF}\cdot Y_F$

For K, $a_{KH}=\Omega_H$ $a_{KF}=\Omega_F$; y_H **a_{LH}**$=1/y_H$

For L, $a_{LH}=1/y_H$ $a_{LF}=1/y_F$; y_F **a_{LF}**$=1/y_F$

		$a_{KH}=\Omega_H$	$a_{KF}=\Omega_F$	y_H / y_F	a_{LH} / a_{LF}	L_H & L_F	Y_H & Y_F	$K=K_H+K_F$	$L=L_H+L_F$
Case 1.	Total	1.3835		4.7448	0.21076	1295	6144	8500	1295
	H: capital-goods	3.7980		10.1668	**0.09836**	90.64	921.55	3500	91
	F: consumption-goods		0.9574	4.3367	**0.23059**	1204.26	5222.45	5000	1204
Case 2.	Total	1.6133		4.7869	0.20891	1295	6199	10000	1295
	H: capital-goods	3.7980		10.1668	**0.09836**	90.64	921.55	3500	91
	F: consumption-goods		1.2318	4.3819	**0.22821**	1204.26	5276.96	6500	1204
Case 3.	Total	1.3658		4.7726	0.20953	1304	6223	8500	1304
	H: capital-goods	3.2999		10.6375	**0.09401**	99.71	1060.64	3500	100
	F: consumption-goods		0.9685	4.2870	**0.23326**	1204.26	5162.70	5000	1204

T2 Case 2. K increases in consumption-goods by 30% **Uzawa [1962]**

Country=capital-goods+consumption-goods: T=H+F						6199	$\Delta Y(0)/Y(0)$	0.00887	$A(0)=k(0)^{1-\alpha}/\Omega(0)$	
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	10000	328	218	546	5652	6199	2464	2136	3.9981
α	Ω(0)	r(0)	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08809	1.61329	0.05460	7.7226	4.78686	0.39752	0.6000	0.36390	0.05285	0.34467	4.3652
H: capital-goods							$\Delta Y_{H(0)}/Y_{H(0)}$	0.00000		
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	90.64	3500.00	89.69	38	128.13	793.42	921.55	1413.11	1323.42	6.1175
α	Ω(0)	$r_{H(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.13903	3.79797	0.03661	38.6130	#######	1.53342	0.7000	1.59093	0.09732	1.43609	8.7532
F: consumption-goods			ΔK/K:	0.3	0.15		$\Delta Y_{F(0)}/Y_{F(0)}$	0.01044		
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1204.26	6500.00	237.92	179.97	417.89	4859.07	5276.96	1050.92	813.00	3.8343
α	Ω(0)	$r_{F(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.07919	1.23177	0.06429	5.3975	4.38192	0.19915	0.5693	0.16134	0.04509	0.15407	4.0349
							$Y_{H(0)}/Y_{F(0)}$	0.17464		

4. The Penrose curve, B_K, and the assets valuation ratio, v

		Ω^*	I/K	$g_K{}^*$	Slope B_K	r^*	r_{M^*}	Slope A	Slope B_K/A	$v=1/\beta^*$
Case 1.	Total	1.3835	0.2388	0.1469	1.6261	0.0578	0.0356	1.6261	1.0000	1.6261
H: capital-goods		3.7980	0.2536	0.2084	1.2168	0.0366	0.0301	1.2168	1.0000	1.2168
F: consumption-goo		0.9574	0.2285	0.1200	1.9039	0.0727	0.0382	1.9039	1.0000	1.9039
Case 2.	Total	1.6133	0.2037	0.1481	1.3751	0.0637	0.0463	1.3751	1.0000	1.5292
H: capital-goods		3.7980	0.3281	0.2084	1.5745	0.0366	0.0233	1.5745	1.0000	1.2187
F: consumption-goo		1.2318	0.1367	0.1212	1.1275	0.0643	0.0570	1.1275	1.0000	1.6734
Case 3.	Total	1.3658	0.2388	0.1467	1.6278	0.0571	0.0351	1.6278	1.0000	1.6347
H: capital-goods		3.2999	0.2245	0.2177	1.0313	0.0537	0.0521	1.0313	1.0000	1.2372
F: consumption-goo		0.9685	0.2489	0.1187	2.0960	0.0607	0.0290	2.0960	1.0000	1.9087

5. The relative price level: real vs. nominal

				(a)	Inf. or def	(b)		(c)	
	$r(0)$	$r=\partial Yt/\partial Kt$	$P_Y=r(0)/r_{real}$	$r_{M(0)\ given}$	$p_Y=r_{M(0)}/r_{rea}$	$r_M{}^*$ at β^*	(a)/(b)	r_{CB} goal see	(a)/(c)
Case 1. Total	0.05782	0.05782	1.0000	0.0330	0.5707	0.0356	0.9280	0.0228	1.4462
H: capital-goods	0.03661	0.03661	1.0000	0.0330	0.9014	0.0301	1.0969	0.0173	1.9064
F: consumption-goo	0.07268	0.07268	1.0000	0.0330	0.4541	0.0382	0.8645	0.0261	1.2647
Case 2. Total	0.05460	0.05460	1.0000	0.0330	0.6044	0.0416	0.7926	0.0228	1.4462
H: capital-goods	0.03661	0.03661	1.0000	0.0330	0.9014	0.0300	1.0986	0.0245	1.3477
F: consumption-goo	0.06429	0.06429	1.0000	0.0330	0.5133	0.0384	0.8589	0.0214	1.5394
Case 3. Total	0.05782	0.05782	1.0000	0.0330	0.5707	0.0349	0.9450	0.0287	1.1511
H: capital-goods	0.05368	0.05368	1.0000	0.0330	0.6148	0.0434	0.7606	0.0245	1.3477
F: consumption-goo	0.06073	0.06073	1.0000	0.0330	0.5434	0.0318	1.0372	0.0236	1.3969

Note: If the price level of output, P_Y, is one, real=nominal and the elasticity of substitution, σ, is always 1.0.

$r(real)=\partial Yt/\partial Kt=\alpha AtKt^{\alpha-1}Lt^{1-\alpha}$ and $w(real)=\partial Yt/\partial Lt=(1-\alpha)AtKt^{\alpha}Lt^{-\alpha}$

6. Relationships between price levels: r_H & w_H for P_H and r_F & w_F for P_F **Rybczynski**

For H, $P_H=a_{KH}.r_H+a_{LH}.w_H$ When real=nominal, the price level is 1.0. The elasticity of substitution is 1.0.

For F, $P_F=a_{KF}.r_F+a_{LF}.w_F$

		r_H	r_F	w_H	w_F	P_H	P_F	$p=P_H/P_F$
Case 1.	Total							
	H: capital-goods	0.03661		8.7532		1		1
	F: consumption-goods		0.07268		4.0349		1	
Case 2.	Total							
	H: capital-goods	0.03661		8.7532		1		1
	F: consumption-goods		0.06429		4.0349		1	
Case 3.	Total							
	H: capital-goods	0.05368		8.7532		1		1
	F: consumption-goods		0.06073		4.0349		1	

T2 Case 3. L increases in capital-goods by 10% **Uzawa [1962]**

Country=capital-goods+consumption-goods: T=H+F | 6223 | $\Delta Y(0)/Y(0)$ | 0.01291 | $A(0)=k(0)^{1-\alpha}/\Omega(0)$

n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	$\Pi(0)$	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1304	8500	295	197	492	5732	6223	2464	2169	4.1158
α	$\Omega(0)$	r(0)	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.07898	1.36583	0.05782	6.5186	4.77263	0.39593	0.6000	0.36588	0.04739	0.34855	4.3957

H: capital-goods | $\Delta L/L$: | 0.1 | | 0.1 | $\Delta Y_{H(0)}/Y_{H(0)}$ | 0.15094

n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	$\Pi(0)$	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	99.71	3500.00	131.52	56	187.88	872.76	1060.64	949.31	817.79	5.6637
α	$\Omega(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.17714	3.29989	0.05368	35.1027	#######	0.89503	0.7000	0.88017	0.12400	0.77104	**8.7532**

F: consumption-goods | $\Delta Y_{F(0)}/Y_{F(0)}$ | -0.01144

n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	$\Pi(0)$	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1204.26	5000.00	163.39	140.24	303.63	4859.07	5162.70	1514.72	1351.33	3.9427
α	$\Omega(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.05881	0.96849	0.06073	4.1519	4.28704	0.29340	0.5381	0.27030	0.03165	0.26175	**4.0349**

Using goal seek, where w_F approaches $w=w_H$ | $Y_{H(0)}/Y_{F(0)}$ | 0.20544

7. The neutrality of financial assets and the coeffcient *x=r/w*

ke*=Ω*^(1/(1−α)) $x_e^*/x_0=k(0)/ke^*$

	r_{CB} goal see	r_M* at β*	r^*/r_{M^*}	$c_{CB}=r_M^*/r_{CB}$	α_x	$x_0=\alpha_x/k(0$	ke*	$x_e^*=\alpha_x/ke^*$	x_0/x_e^*
Case 1. Total	0.0228	0.0356	1.6261	1.55842	0.0870	0.0132	1.4231	0.0611	0.2168
H: capital-goods	0.0173	0.0301	1.2168	1.73793	0.1615	0.0042	4.7113	0.0343	0.1220
F: consumption-goo	0.0261	0.0382	1.9039	1.46297	0.0748	0.0180	0.9543	0.0784	0.2298
	goal seek			**goal seek**	$\alpha_x=\alpha/(1-\alpha)$				
Case 2. Total	0.0228	0.0416	1.3751	2.02926	0.0966	0.0125	1.6896	0.0572	0.2188
H: capital-goods	0.0245	0.0300	1.5745	0.94951	0.1615	0.0042	4.7113	0.0343	0.1220
F: consumption-goo	0.0214	0.0384	1.1275	2.65982	0.0860	0.0139	1.2541	0.0686	0.2020
Case 3. Total	0.0287	0.0349	1.6278	1.22334	0.0858	0.0133	1.4028	0.0611	0.2182
H: capital-goods	0.0245	0.0434	1.0313	2.12589	0.2153	0.0046	4.2669	0.0505	0.0912
F: consumption-goo	0.0236	0.0318	2.0960	1.22640	0.0625	0.0180	0.9665	0.0646	0.2786

Note: When the effective labour is used, the coefficient, x_0 and x_e, are connected with *ke* (0) (see also below).

8. Data for the Hecksher-Ohlin, Rybczynski, the Stolper-Samuelson, and Leontief paradox

$p=P_M/P_F=1$	k(0)	$\Delta k/k(0)$		*sigma*	w(0)=w(re	w(0)/r(0)	r(0)/w(0)	k/(w/r)	α_x(w/r)
Case 1. Total	6.5642	(Δ(w/r)/(w/r)			4.3652	75.49	0.0132	0.0870	6.5642
H: capital-goods	38.6130	0.0000	0.0000	#DIV/0!	8.7532	239.11	0.0042	0.1615	38.6130
F: consumption-goo	4.1519	0.0000	0.0000	#DIV/0!	4.0349	55.52	0.0180	0.0748	4.1519
								=α/(1-α)=α_x	=k(0)
Case 2. Total	7.7226				4.3652	79.95	0.0125	0.0966	7.7226
H: capital-goods	38.6130	0.0000	0.0000	#DIV/0!	8.7532	239.11	0.0042	0.1615	38.6130
F: consumption-goo	5.3975	0.3000	0.1304	-2.3000	4.0349	62.76	0.0159	0.0860	5.3975
Case 3. Total	6.5186				4.3957	76.02	0.0132	0.0858	6.5186
H: capital-goods	35.1027	-0.0909	(0.3180)	-0.2858	8.7532	163.06	0.0061	0.2153	35.1027
F: consumption-goo	4.1519	0.0000	0.1968	0.0000	4.0349	66.44	0.0151	0.0625	4.1519

Note: When the effective labour is used, the current wage rate and the profit rate are connected with *k* (0).

Rybczenski [1955] only holds under the condition of H-O.

9. Introduction of relative price level, $p=P_H/P_F$: Duality [Jones, R. W., 1965] S-Samuelson [1941]

$r_F=r_F(0)=\partial Y_F/\partial K_F$ $r_H(0)_{nominal}=p\cdot(\partial Y_H/\partial K_H)$, where $p=P_H/P_F$ $w_F=w_F(0)=\partial Y_F/\partial L_F$ $w_{H(0)nominal}=p\cdot(\partial Y_H/\partial L_H)$

	Marginal productivity	$r_{H(marg.pro.)}$	$r_{F(margi.Pro.)}$	$w_{H(margi.Pro.}$	$w_{F(matgi.pro.)}$	P_H	P_F	$p=P_H/P_F$	Changes (%)
Case 1.	Total	0.05782		4.3652					for r & w
	H: capital-goods	0.03661		8.7532		1		1.00000	1.0000
	F: consumption-goods		0.07268		4.0349		1		1.4664
Case 2.	Total	0.05460		4.3652					0.8846
	H: capital-goods	**0.03661**		8.7532		1		1.00000	0.8356
	F: consumption-goods		0.06429		4.0349		1		1.0000
Case 3.	Total	0.05782		4.3957					1.0000
	H: capital-goods	0.05368		8.7532		1		1.00000	1.0000
	F: consumption-goods		0.06073		**4.0349**		1		1.0000

T3 Case 1. Both regions have different rates of profit and the wage rates **Y(0) up with p=1**

Country=capital-goods+consumption-goods: T=H+F							6144		$A(0)=k(0)^{1-\alpha}/\Omega(0)$	
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	$\Pi(0)$	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	8500	295	197	492	5652	6144	2464	2169	4.0817
α	$\Omega(0)$	r(0)	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08000	1.38346	0.05782	6.5642	4.7448	0.40105	0.6000	0.37085	0.04800	0.35305	4.3652
H: capital-goods			s=S/Y	0.40105	0.26068	0.14037		0.44115		
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	$\Pi(0)$	W(0)	$Y_H(0)\neq\Delta K($	S(0)	$S_H(0)$	A(0)
0.00755	90.64	3500.00	89.69	38	128.13	793.42	921.55	1087.01	997.32	6.1175
α	$\Omega(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.13903	3.79797	0.03661	38.6130	10.1668	1.17955	0.7000	1.19891	0.09732	1.08223	8.7532
F: consumption-goods			c=1-s	0.59895						
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	$\Pi(0)$	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1204.26	5000.00	205.22	158.17	363.38	4859.07	5222.45	1377.02	1171.80	3.9277
α	$\Omega(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.06958	0.95740	0.07268	4.1519	4.3367	0.26367	0.5647	0.23356	0.03930	0.22438	4.0349
Cases correspond with Hecksher-Ohlin by region.							$Y_{H(0)}/Y_{F(0)}$	0.17646	**Uzawa [1962]: $\Omega_H>\Omega_F$**	

1. Basic variables and parameters under convergence

	$g_Y{}^*=g_K{}^*$	$g_A{}^*$	$g_y{}^*$	Ω^*	r^*	i	$\beta^*{}_{(\delta=\alpha)}$	n	α
Case 1. Total	0.1469	0.1272	0.1383	1.3835	0.0578	0.33044	0.6150	0.00755	0.08000
H: capital-goods	0.2084	0.1716	0.1993	3.7980	0.0366	0.96311	0.8218	0.00755	0.13903
F: consumption-goo	0.1200	0.1039	0.1116	0.9574	0.0727	0.21880	0.5252	0.00755	0.06958
Case 2. Total	0.1790	0.1546	0.1701	1.3664	0.0668	0.39918	0.6127	0.00755	0.09132
H: capital-goods	0.3007	0.2633	0.2910	2.1392	0.0445	0.90660	0.7096	0.00755	0.09509
F: consumption-goo	0.1391	0.1188	0.1306	1.1921	0.0759	0.28467	0.5827	0.00755	0.09046
Case 3. Total	0.1736	0.1504	0.1648	1.2377	0.0708	0.36524	0.5883	0.00755	0.08767
H: capital-goods	0.2572	0.2283	0.2478	2.0231	0.0389	0.74864	0.6951	0.00755	0.07869
F: consumption-goo	0.1467	0.1257	0.1381	1.0680	0.0839	0.28240	0.5548	0.00755	0.08961

2. Basic variables and parameters under the current situation (*delta>alpha*)

	$g_{Y(a)}$	$g_{K(a)}$	$g_{A(a)}$	$g_{y(a)}$	delta	$\beta_{actual\ (\delta>\alpha)}$	$\beta*-\beta$	$k(0)$	$y(0)$
Case 1. Total	0.0800	0.3000	0.0491	0.0718	0.0890	0.84900	-0.2340	6.5642	4.7448
H: capital-goods	0.0400	0.4000	0.0255	0.0322	0.0704	0.97943	-0.1576	38.6130	10.1668
F: consumption-goo	0.0108	0.1039	-0.0034	0.0032	0.0956	1.01633	-0.4911	4.1519	4.3367
For min capital good growth		0.0578							
Case 2. Total	0.0800	0.3000	0.0457	0.0718	0.0862	0.88649	-0.2738	6.5642	4.8039
H: capital-goods	0.0400	0.4000	-0.0049	0.0322	0.0894	1.00529	-0.2957	11.6076	5.4261
F: consumption-goo	0.0443	0.0933	0.0290	0.0365	0.0851	0.89916	-0.3165	5.5820	4.6827
Case 3. Total	0.0800	0.3000	0.0468	0.0718	0.0867	0.87206	-0.2838	7.4446	6.0150
H: capital-goods	0.0400	0.4000	0.0016	0.0322	0.0846	0.99787	-0.3028	13.2658	6.5572
F: consumption-goo	0.0453	0.0940	0.0300	0.0375	0.0858	0.89453	-0.3398	6.3109	5.9094

$g_{A(a)}=g_{Y(a)}-\alpha g_{K(a)}-(1-\alpha)n$ delta=(n+α(i-iβ*-n))/(i(1-β*)) $\beta_{actual(\delta>\alpha)}=1-((1/i)(g_{A(a)}k(0)\text{^}(\delta-\alpha))$

Heckscher-Ohlin

3. Relationships between quantities: K_H & K_F and L_H & L_F $K=(a_{KH}\cdot y_H)L_H+(a_{KF}\cdot y_F)L_F$ $K=a_{KH}\cdot Y_H+a_{KF}\cdot Y_F$

For K, $a_{KH}=\Omega_H$ $a_{KF}=\Omega_F$ y_H $a_{LH}=1/y_H$ $L=(a_{LH}\cdot y_H)L_H+(a_{LF}\cdot y_F)L_F$ $L=a_{LH}\cdot Y_H+a_{LF}\cdot Y_F$

For L, $a_{LH}=1/y_H$ $a_{LF}=1/y_F$

		$a_{KH}=\Omega_H$	$a_{KF}=\Omega_F$	y_F	$a_{LF}=1/y_F$	L_H &L_F	Y_H &Y_F	$K=K_H+K_F$	$L=L_H+L_F$
Case 1.	Total	1.3835		4.7448	0.21076	1295	6144	8500	1295
	H: capital-goods	3.7980		10.1668	**0.09836**	90.64	921.55	3500	91
	F: consumption-goods		0.9574	4.3367	**0.23059**	1204.26	5222.45	5000	1204
Case 2.	Total	1.3664		4.8039	0.20817	1295	6221	8500	1295
	H: capital-goods	2.1392		5.4261	**0.18429**	211.07	1145.28	2450	211
	F: consumption-goods		1.1921	4.6827	**0.21355**	1083.83	5075.24	6050	1084
Case 3.	Total	1.2377		6.0150	0.16625	1295	7789	9640	1295
	H: capital-goods	2.0231		6.5572	**0.15250**	211.07	1384.03	2800	211
	F: consumption-goods		1.0680	5.9094	**0.16922**	1083.83	6404.79	6840	1084

T3 Case 2. Both K amd L positively shift to equalize the profit rate in both goods **Uzawa [1962]**

Country=capital-goods+consumption-goods: T=H+F						6221	ΔY(0)/Y(0)	0.01245	$A(0)=k(0)^{1-\alpha}/\Omega(0)$	
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	8500	341	227	568	5652	6221	3019	2678	4.0455
α	Ω(0)	r(0)	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.09132	1.36645	0.06683	6.5642	4.8039	0.48527	0.6000	0.45544	0.05479	0.43048	4.3652
H: capita	120.43	1050.00	ΔK/K:	-0.3	-0.15	242.95	$\Delta Y_{H(0)}/Y_{H(0)}$	0.24278		
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	211.07	2450.00	76.24	33	**108.91**	1036.37	1145.28	1278.84	1202.60	4.2977
α	Ω(0)	$r_{H(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.09509	2.13921	**0.04445**	11.6076	5.4261	1.11661	0.7000	1.12493	0.06657	1.05005	4.9101
F: consumption-gc		19.22	ΔL/L:	-0.1	-0.05		$\Delta Y_{F(0)}/Y_{F(0)}$	-0.02819		
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1083.83	6050.00	264.58	194.54	459.12	4616.12	5075.24	1739.82	1475.24	4.0081
α	Ω(0)	$r_{F(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.09046	1.19206	0.07589	5.5820	4.6827	0.34281	0.5763	0.30666	0.05213	0.29067	4.2591
							$Y_{H(0)}/Y_{F(0)}$	0.22566		

4. The Penrose curve, B_K, and the assets valuation ratio, v

	Ω^*	I/K	g_K^*	Slope B_K	r^*	r_{M^*}	Slope A	Slope B_K/A	$v=1/\beta^*$
Case 1. Total	1.3835	0.2388	0.1469	1.6261	0.0578	0.0356	1.6261	1.0000	1.6261
H: capital-goods	3.7980	0.2536	0.2084	1.2168	0.0366	0.0301	1.2168	1.0000	1.2168
F: consumption-goo	0.9574	0.2285	0.1200	1.9039	0.0727	0.0382	1.9039	1.0000	1.9039
Case 2. Total	1.3664	0.2921	0.1486	1.9656	0.0660	0.0336	1.9656	1.0000	1.6322
H: capital-goods	2.1392	0.4238	0.1986	2.1335	0.0445	0.0208	2.1335	1.0000	1.4093
F: consumption-goo	1.1921	0.2388	0.1226	1.9476	0.0759	0.0390	1.9476	1.0000	1.7162
Case 3. Total	1.2377	0.2951	0.1481	1.9932	0.0634	0.0318	1.9932	1.0000	1.6998
H: capital-goods	2.0231	0.3700	0.1952	1.8954	0.0389	0.0205	1.8954	1.0000	1.4387
F: consumption-goo	1.0680	0.2644	0.1225	2.1584	0.0839	0.0389	2.1584	1.0000	1.8026

5. The relative price level: real vs. nominal

				(a)	Inf. or def	(b)		(c)	
	$r(0)$	$r=\partial Yt/\partial Kt$	$P_Y=r(0)/r_{real}$	$r_{M(0)\ given}$	$p_Y=r_{M(0)}/r_{rea}$	r_M^* at β^*	(a)/(b)	$r_{CB\ goal\ see}$	(a)/(c)
Case 1. Total	0.05782	0.05782	1.0000	0.0330	0.5707	0.0356	0.9280	0.0228	1.4462
H: capital-goods	0.03661	0.03661	1.0000	0.0330	0.9014	0.0301	1.0969	0.0173	1.9064
F: consumption-goo	0.07268	0.07268	1.0000	0.0330	0.4541	0.0382	0.8645	0.0261	1.2647
Case 2. Total	0.06683	0.06683	1.0000	0.0330	0.4938	0.0404	0.8160	0.0228	1.4462
H: capital-goods	0.04445	0.04445	1.0000	0.0330	0.7424	0.0315	1.0462	0.0245	1.3477
F: consumption-goo	0.07589	0.07589	1.0000	0.0330	0.4349	0.0442	0.7463	0.0214	1.5394
Case 3. Total	0.07083	0.07083	1.0000	0.0330	0.4659	0.0373	0.8852	0.0287	1.1511
H: capital-goods	0.03890	0.03890	1.0000	0.0330	0.8484	0.0270	1.2206	0.0245	1.3477
F: consumption-goo	0.08390	0.08390	1.0000	0.0330	0.3933	0.0465	0.7090	0.0236	1.3969

Note: If the price level of output, P_Y, is one, real=nominal and the elasticity of substitution, σ, is always 1.0.

$r(real)=\partial Yt/\partial Kt=\alpha AtKt^{\alpha-1}Lt^{1-\alpha}$ and $w(real)=\partial Yt/\partial Lt=(1-\alpha)AtKt^{\alpha}Lt^{-\alpha}$

6. Relationships between price levels: r_H & w_H for P_H and r_F & w_F for P_F **Rybczynski**

For H, $P_H=a_{KH}.r_H+a_{LH}.w_H$ When real=nominal, the price level is 1.0. The elasticity of substitution is 1.0.

For F, $P_F=a_{KF}.r_F+a_{LF}.w_F$

		r_H	r_F	w_H	w_F	P_H	P_F	$p=P_H/P_F$
Case 1.	Total							
	H: capital-goods	0.03661		8.7532		1		1
	F: consumption-goods		0.07268		4.0349		1	
Case 2.	Total							
	H: capital-goods	0.04445		4.9101		1		1
	F: consumption-goods		0.07589		4.2591		1	
Case 3.	Total							
	H: capital-goods	0.03890		6.0413		1		1
	F: consumption-goods		0.08390		5.3799		1	

T3 Case 3. Both K amd L much positively shift to equalize the wage rate in both goods **Uzawa [1962]**

Country=capital-goods+consumption-goods: T=H+F						7789	ΔY(0)/Y(0)	0.26771	$A(0)=k(0)^{1-\alpha}/\Omega(0)$	
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9640	410	273	683	7106	7789	3454	3044	5.0443
α	Ω(0)	r(0)	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08767	1.23767	0.07083	7.4446	6.0150	0.44341	0.6000	0.41250	0.05260	0.39081	5.4877
H: capita	120.43	700.00	ΔK/K:	-0.2	-0.15	481.70	$\Delta Y_{H(0)}/Y_{H(0)}$	0.50186		
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	211.07	2800.00	65.34	44	**108.91**	1275.12	1384.03	1278.84	1213.49	5.3503
α	Ω(0)	$r_{H(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.07869	2.02308	0.03890	13.2658	6.5572	0.92399	0.6000	0.92023	0.04721	0.87678	**6.0413**
F: consumption-g		19.22	ΔL/L:	-0.1	0.2		$\Delta Y_{F(0)}/Y_{F(0)}$	0.22639		
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1083.83	6840.00	344.34	229.56	573.90	5830.88	6404.79	2174.77	1830.43	5.0101
α	Ω(0)	$r_{F(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.08961	1.06795	0.08390	6.3109	5.9094	0.33955	0.6000	0.30203	0.05376	0.28579	**5.3799**
Using goal seek, where w_F approaches $w=w_H$							$Y_{H(0)}/Y_{F(0)}$	0.21609		

7. The neutrality of financial assets and the coeffcient *x=r/w*

$ke^*=\Omega^*$^(1/(1−α)) $x_e^*/x_0=k(0)/ke^*$

	r_{CB} goal see	r_M* at β*	r^*/r_{M^*}	$c_{CB}=r_M^*/r_{CB}$	α_x	$x_0=\alpha_x/k(0$	ke*	$x_e^*=\alpha_x/ke^*$	x_0/x_e^*
Case 1. Total	0.0228	0.0356	1.6261	1.55842	0.0870	0.0132	1.4231	0.0611	0.2168
H: capital-goods	0.0173	0.0301	1.2168	1.73793	0.1615	0.0042	4.7113	0.0343	0.1220
F: consumption-goo	0.0261	0.0382	1.9039	1.46297	0.0748	0.0180	0.9543	0.0784	0.2298
	goal seek			**goal seek**	$\alpha_x=\alpha/(1-\alpha)$				
Case 2. Total	0.0228	0.0404	1.9656	1.47159	0.1005	0.0153	1.4100	0.0713	0.2148
H: capital-goods	0.0245	0.0315	2.1335	0.85090	0.1051	0.0139	2.3172	0.0454	0.3068
F: consumption-goo	0.0214	0.0442	1.9476	1.81763	0.0995	0.0134	1.2131	0.0820	0.1634
Case 3. Total	0.0287	0.0373	1.9932	1.10895	0.0961	0.0117	1.2633	0.0761	0.1536
H: capital-goods	0.0245	0.0270	1.8954	0.83812	0.0854	0.0122	2.1486	0.0398	0.3062
F: consumption-goo	0.0236	0.0465	2.1584	1.64544	0.0984	0.0118	1.0749	0.0916	0.1294

Note: When the effective labour is used, the coefficient, x_0 and x_e, are connected with *ke* (0) (see also below).

8. Data for the Heckshser-Ohlin, Rybczynski, the Stolper-Samuelson, and Leontief paradox

$p=P_M/P_F=1$	k(0)	Δk/k(0)		*sigma*	w(0)=w(re	w(0)/r(0)	r(0)/w(0)	k/(w/r)	α_x(w/r)
Case 1. Total	6.5642	(Δ(w/r)/(w/r)			4.3652	75.49	0.0132	0.0870	6.5642
H: capital-goods	38.6130	0.0000	0.0000	#DIV/0!	8.7532	239.11	0.0042	0.1615	38.6130
F: consumption-goo	4.1519	0.0000	0.0000	#DIV/0!	4.0349	55.52	0.0180	0.0748	4.1519
								=α/(1-α)=α_x	=k(0)
Case 2. Total	6.5642				4.3652	65.32	0.0153	0.1005	6.5642
H: capital-goods	11.6076	-0.6994	(0.5380)	-1.2999	4.9101	110.46	0.0091	0.1051	11.6076
F: consumption-goo	5.5820	0.3444	0.0109	-31.6386	4.2591	56.12	0.0178	0.0995	5.5820
Case 3. Total	7.4446				5.4877	77.48	0.0129	0.0961	7.4446
H: capital-goods	13.2658	-0.6564	(0.3504)	-1.8733	6.0413	155.32	0.0064	0.0854	13.2658
F: consumption-goo	6.3109	0.5200	0.1549	-3.3566	5.3799	64.12	0.0156	0.0984	6.3109

Note: When the effective labour is used, the current wage rate and the profit rate are connected with *k* (0).

Rybczenski [1955] only holds under the condition of H-O.

9. Introduction of relative price level, $p=P_H/P_F$: Duality [Jones, R. W., 1965] **S-Samuelson [1941]**

$r_F=r_F(0)=\partial Y_F/\partial K_F$ $r_H(0)_{nominal}=p\cdot(\partial Y_H/\partial K_H)$, where $p=P_H/P_F$ $w_F=w_F(0)=\partial Y_F/\partial L_F$ $w_{H(0)nominal}=p\cdot(\partial Y_H/\partial L_H)$

	Marginal productivity	$r_{H(marg.pro.)}$	$r_{F(margi.Pro.)}$	$w_{H(margi.Pro.}$	$w_{F(matgi.pro.)}$	P_H	P_F	$p=P_H/P_F$	Changes (%)
Case 1.	Total	0.05782		4.3652					for r & w
	H: capital-goods	0.03661		8.7532		1		1.00000	1.2143
	F: consumption-goods		0.07268		4.0349		1		1.0625
Case 2.	Total	0.06683		4.3652					1.0442
	H: capital-goods	**0.04445**		4.9101		1		1.00000	1.1545
	F: consumption-goods		0.07589		4.2591		1		0.5609
Case 3.	Total	0.07083		5.4877					0.6902
	H: capital-goods	0.03890		6.0413		1		1.00000	1.0556
	F: consumption-goods		0.08390		**5.3799**		1		1.3333

T4 Case 1. Both regions have different rates of profit and the wage rates **Y(0) up with p≠1**

World=capital-ample country+labour-ample country: W=H+F							6144		$A(0)=k(0)^{1-\alpha}/\Omega(0)$	
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	8500	295	197	492	5652	6144	2464	2169.12	4.0817
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08000	1.38346	0.05782	6.5642	4.7448	**0.40105**	0.6000	0.37085	0.04800	0.35305	4.3652
H: capital-ample country			s=S/Y	0.40105	0.26068	0.14037		0.44115		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	90.64	3500.00	89.69	38	128.13	793.42	921.55	1087.01	997.32	6.1175
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.13903	3.79797	0.03661	38.6130	10.1668	1.17955	0.7000	1.19891	0.09732	1.08223	8.7532
F: laour-ample country			c=1-s	0.59895						
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1204.26	5000.00	205.22	158.17	363.38	4859.07	5222.45	1377.02	1171.80	3.9277
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.06958	0.95740	0.07268	4.1519	4.3367	0.26367	0.5647	0.23356	0.03930	0.22438	4.0349
Cases correspond with Hecksher-Ohlin by region.							$Y_{H(0)}/Y_{F(0)}$	0.17646	Uzawa [1962]: $\Omega_H>\Omega_F$	

1. Basic variables and parameters under convergence (*delta=alpha*)

		$g_Y^*=g_K^*$	g_A^*	g_y^*	Ω^*	r^*	i	$\beta^*_{(\delta=\alpha)}$	n	α
Case 1.	World	0.1469	0.1272	0.1383	1.3835	0.0578	0.33044	0.6150	0.00755	0.08000
	H: capital-ample country	0.2084	0.1716	0.1993	3.7980	0.0366	0.96311	0.8218	0.00755	0.13903
	F: labour-ample country	0.1200	0.1039	0.1116	0.9574	0.0727	0.21880	0.5252	0.00755	0.06958
Case 2.	World	0.1790	0.1546	0.1701	1.3664	0.0668	0.39918	0.6127	0.00755	0.09132
	H: capital-ample country	0.3001	0.2627	0.2904	2.1392	0.0445	0.90470	0.7096	0.00755	0.09509
	F: labour-ample country	0.1394	0.1190	0.1308	1.1921	0.0759	0.28510	0.5827	0.00755	0.09046
Case 3.	World	0.1736	0.1504	0.1648	1.2377	0.0708	0.36524	0.5883	0.00755	0.08767
	H: capital-ample country	0.2572	0.2283	0.2478	2.0231	0.0389	0.74864	0.6951	0.00755	0.07869
	F: labour-ample country	0.1467	0.1257	0.1381	1.0680	0.0839	0.28240	0.5548	0.00755	0.08961

2. Basic variables and parameters under the current situation (*delta>alpha*)

		$g_{Y(a)}$	$g_{K(a)}$	$g_{A(a)}$	$g_{y(a)}$	*delta*	$\beta_{actual\ (\delta>\alpha)}$	$\beta^*-\beta$	$k(0)$	$y(0)$
Case 1.	World	0.0800	0.3000	0.0491	0.0718	0.0890	0.84900	-0.2340	6.5642	4.7448
	H: capital-ample country	0.0400	0.4000	0.0255	0.0322	0.0704	0.97943	-0.1576	38.6130	10.1668
	F: labour-ample country	0.0108	0.1039	-0.0034	0.0032	0.0956	1.01633	-0.4911	4.1519	4.3367
For min capital good growth			0.0578							
Case 2.	World	0.0800	0.3000	0.0457	0.0718	0.0862	0.88649	-0.2738	6.5642	4.8039
	H: capital-ample country	0.0400	0.4000	-0.0049	0.0322	0.0894	1.00531	-0.2957	11.6076	5.4261
	F: labour-ample country	0.0443	0.0933	0.0290	0.0365	0.0851	0.89932	-0.3167	5.5820	4.6827
Case 3.	World	0.0800	0.3000	0.0468	0.0718	0.0867	0.87206	-0.2838	7.4446	6.0150
	H: capital-ample country	0.0400	0.4000	0.0016	0.0322	0.0846	0.99787	-0.3028	13.2658	6.5572
	F: labour-ample country	0.0453	0.0940	0.0300	0.0375	0.0858	0.89453	-0.3398	6.3109	5.9094

$g_{A(a)}=g_{Y(a)}-\alpha g_{K(a)}-(1-\alpha)n$ delta$=(n+\alpha(i-i\beta^*-n))/(i(1-\beta^*))$ $\beta_{actual(\delta>\alpha)}=1-((1/i)(g_{A(a)}k(0)\hat{}(\delta-\alpha))$

Stolper-Samuelson

3. Relationships between quantities: K_H & K_F and L_H & L_F $K=(a_{KH}\cdot y_H)L_H+(a_{KF}\cdot y_F)L_F$ $K=a_{KH}\cdot Y_H+a_{KF}\cdot Y_F$

							$L=(a_{LH}\cdot y_H)L_H+(a_{LF}\cdot y_F)L_F$		$L=a_{LH}\cdot Y_H+a_{LF}\cdot Y_F$	
For K,	$a_{KH}=\Omega_H$	$a_{KF}=\Omega_F$			y_H	$a_{LH}=1/y_H$				
For L,	$a_{LH}=1/y_H$	$a_{LF}=1/y_F$	$a_{KH}=\Omega_H$	$a_{KF}=\Omega_F$	y_F	$a_{LF}=1/y_F$	L_H & L_F	Y_H & Y_F	$K=K_H+K_F$	$L=L_H+L_F$
Case 1.	World		1.3835		4.7448	0.21076	1295	6144	8500.00	1294.90
	H: capital-ample country		3.7980		10.1668	**0.09836**	90.64	921.55	3500	91
	F: labour-ample country			0.9574	4.3367	**0.23059**	1204.26	5222.45	5000	1204
Case 2.	World		1.3664		4.8039	0.20817	1295	6221	8500	1295
	H: capital-ample country		2.1392		5.4261	**0.18429**	211.07	1145.28	2450	211
	F: labour-ample country			1.1921	4.6827	**0.21355**	1083.83	5075.24	6050	1084
Case 3.	World		1.2377		6.0150	0.16625	1295	7789	9640	1295
	H: capital-ample country		2.0231		6.5572	**0.15250**	211.07	1384.03	2800	211
	F: labour-ample country			1.0680	5.9094	**0.16922**	1083.83	6404.79	6840	1084

T4 Case 2. Using r and w with the price level **Here, start from the proice level** **Uzawa [1962]**

World=capital-ample country+labour-ample country: W						6221	$\Delta Y(0)/Y(0)$	0.01245	$A(0)=k(0)^{1-\alpha}/\Omega(0)$	
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	$\Pi(0)$	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	8500	341	227	568	5652	6221	3019	2677.84	4.0455
α	$\Omega(0)$	r(0)	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.09132	1.36645	0.16039	6.5642	4.8039	**0.48527**	0.6000	0.45544	0.05479	0.43048	3.0987
H: capita	120.43	1050.00	$\Delta K/K$:	-0.3	-0.15	242.95	$\Delta Y_{H(0)}/Y_{H(0)}$	0.24278		
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	$\Pi(0)$	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	211.07	2450.00	65.34	44	**108.91**	1036.37	1145.28	1278.84	1213.49	4.2977
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.09509	2.13921	0.16039	11.6076	5.4261	1.11661	0.6000	1.12367	0.05706	1.05956	3.0987
F: laour-ample cou		19.22	$\Delta L/L$:	-0.1	-0.05		$\Delta Y_{F(0)}/Y_{F(0)}$	-0.02819		
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	$\Pi(0)$	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1083.83	6050.00	275.47	183.65	459.12	4616.12	5075.24	1739.82	1464.35	4.0081
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.09046	1.19206	0.16039	5.5820	4.6827	0.34281	0.6000	0.30509	0.05428	0.28853	3.0987
							$Y_{H(0)}/Y_{F(0)}$	0.22566		**$\Omega_{H(0)}>\Omega_{F(0)}$**

4. The Penrose curve, B_K, and the assets valuation ratio, v

		Ω^*	I/K	$g_K{}^*$	Slope B_K	r^*	r_{M^*}	Slope A	Slope B_K/A	$v=1/\beta^*$
Case 1.	World	1.3835	0.2388	0.1469	1.6261	0.0578	0.0356	1.6261	1.0000	1.6261
H: capital-ample country		3.7980	0.2536	0.2084	1.2168	0.0366	0.0301	1.2168	1.0000	1.2168
F: labour-ample country		0.9574	0.2285	0.1200	1.9039	0.0727	0.0382	1.9039	1.0000	1.9039
Case 2.	World	1.3664	0.2921	0.1486	1.9656	0.0660	0.0336	1.9656	1.0000	1.6322
H: capital-ample country		2.1392	0.4229	0.1986	2.1290	0.0445	0.0209	2.1290	1.0000	1.4093
F: labour-ample country		1.1921	0.2392	0.1226	1.9505	0.0759	0.0389	1.9505	1.0000	1.7163
Case 3.	World	1.2377	0.2951	0.1481	1.9932	0.0634	0.0318	1.9932	1.0000	1.6998
H: capital-ample country		2.0231	0.3700	0.1952	1.8954	0.0389	0.0205	1.8954	1.0000	1.4387
F: labour-ample country		1.0680	0.2644	0.1225	2.1584	0.0839	0.0389	2.1584	1.0000	1.8026

5. The relative price level: real vs. nominal

					(a)	Inf or def	(b)		(c)	
		$r(0)$	$r=\partial Yt/\partial Kt$	$P_Y=r(0)/r_{real}$	$r_{M(0)\ given}$	$p_Y=r_{M(0)}/r_{real}$	$r_M{}^*$ at β^*	(a)/(b)	$r_{CB\ given}$	(a)/(c)
Case 1.	World	0.05782	0.05782	1.0000	0.0330	0.5707	0.0356	0.9280	0.027	1.2222
H: capital-ample country		0.03661	0.03661	1.0000	0.0330	0.9014	0.0301	1.0969	0.027	1.2222
F: labour-ample country		0.07268	0.07268	1.0000	0.0330	0.4541	0.0382	0.8645	0.027	1.2222
Case 2.	World	0.16039	0.06683	2.4001	0.0325	0.4863	0.0404	0.8037	0.027	1.2037
H: capital-ample country		0.16039	0.04445	3.6082	0.0300	0.6749	0.0315	0.9511	0.027	1.1111
F: labour-ample country		0.16039	0.07589	2.1135	0.0330	0.4349	0.0442	0.7463	0.027	1.2222
Case 3.	World	0.09324	0.07083	1.3164	0.0310	0.4377	0.0373	0.8316	0.027	1.1481
H: capital-ample country		0.09324	0.03890	2.3972	0.0330	0.8484	0.0270	1.2206	0.027	1.2222
F: labour-ample country		0.09324	0.08390	1.1113	0.0300	0.3576	0.0465	0.6445	0.027	1.1111

Note: If the price level of output, P_Y, is one, real=nominal and the elasticity of substitution, σ, is always 1.0.

$r(real)=\partial Yt/\partial Kt=\alpha AtKt^{\wedge\alpha-1}Lt^{1-\alpha}$ and $w(real)=\partial Yt/\partial Lt=(1-\alpha)AtKt^{\alpha}Lt^{-\alpha}$

6. Relationships between price levels: r_H & w_H for P_H and r_F & w_F for P_F Stolper-Samuelson

For H,	$P_H=a_{KH}.r_H+a_{LH}.w_H$	When real=nominal, the price level is 1.0.				The elasticity of substitution is 1.0.			
For F,	$P_F=a_{KF}.r_F+a_{LF}.w_F$	r_H	r_F	w_H	w_F	P_H	P_F	$p=P_H/P_F$	
Case 1.	World	0.05782		4.3652		1.0000		1.0000	For p,
	H: capital-ample country	0.03661		8.7532		1		1	using goal
	F: labour-ample country		0.07268		4.0349		1		seek
Case 2.	World	0.16039		3.0987		0.8642		0.8642	Y(0)
	H: capital-ample country	0.16039		3.0987		**1.17811**		1.17811	6221
	F: labour-ample country		0.16039		3.0987		**1**		6221
Case 3.	World	0.09324		5.3210		1.0000		1.0000	Y(0)
	H: capital-ample country	0.09324		5.3210		**1.00009**		1.00009	7789
	F: labour-ample country		0.09324		5.3210		**1**		7789

T4 Case 3. Using r and w with the price level Here, start from the proice level Uzawa [1962]

World=capital-ample country+labour-ample country: W						7788.82	$\Delta Y(0)/Y(0)$	0.26771	$A(0)=k(0)^{1-\alpha}/\Omega(0)$	
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9640	410	273	683	7106	7789	3454	3044	5.0443
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08767	1.23767	0.09324	7.4446	6.0150	**0.44341**	0.6000	0.41250	0.05260	0.39081	5.3210
H: capita	120.43	700.00	ΔK/K:	-0.2	-0.15	481.70	$\Delta Y_{H(0)}/Y_{H(0)}$	0.50186		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	211.07	2800.00	65.34	44	**108.91**	1275.12	1384.03	1278.84	1213.49	5.3503
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.07869	2.02308	0.09324	13.2658	6.5572	0.92399	0.6000	0.92023	0.04721	0.87678	5.3210
F: laour-ample co		19.22	ΔL/L:	-0.1	0.2		$\Delta Y_{F(0)}/Y_{F(0)}$	0.22639		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1083.83	6840.00	344.34	229.56	573.90	5830.88	6404.79	2174.77	1830.43	5.0101
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.08961	1.06795	0.09324	6.3109	5.9094	0.33955	0.6000	0.30203	0.05376	0.28579	5.3210
S-S proposes that if the price of H goods rises then the price of F go							$Y_{H(0)}/Y_{F(0)}$	0.21609		$\Omega_{H(0)}>\Omega_{F(0)}$

7. The neutrality of financial assets and the coeffcient *x=r/w*

$ke^*=\Omega^*$^(1/(1−α)) $x_e^*/x_0=k(0)/ke^*$

	$r_{CB\ given}$	r_M^* at β^*	r^*/r_{M^*}	$c_{CB}=r_M^*/r_{CB}$	α_x	$x_0=\alpha_x/k(0$	ke*	$x_e^*=\alpha_x/ke^*$	x_0/x_e^*
Case 1. World	0.027	0.0356	1.6261	1.31705	0.0870	0.0132	1.4231	0.0611	0.2168
H: capital-ample country	0.027	0.0301	1.2168	1.11423	0.1615	0.0042	4.7113	0.0343	0.1220
F: labour-ample country	0.027	0.0382	1.9039	1.41381	0.0748	0.0180	0.9543	0.0784	0.2298
					$\alpha_x=\alpha/(1-\alpha)$				
Case 2. World	0.027	0.0404	1.9656	1.24370	0.1005	0.0153	1.4100	0.0713	0.2148
H: capital-ample country	0.027	0.0315	2.1290	0.77330	0.1051	0.0139	2.3172	0.0454	0.3068
F: labour-ample country	0.027	0.0442	1.9505	1.44099	0.0995	0.0134	1.2131	0.0820	0.1634
Case 3. World	0.027	0.0373	1.9932	1.17745	0.0961	0.0117	1.2633	0.0761	0.1536
H: capital-ample country	0.027	0.0270	1.8954	0.76006	0.0854	0.0122	2.1486	0.0398	0.3062
F: labour-ample country	0.027	0.0465	2.1584	1.43972	0.0984	0.0118	1.0749	0.0916	0.1294

Note: When the effective labour is used, the coefficient, x_0 and x_e, are connected with ke(0) (see also below).

8. Data for the Heckser-Ohlin, Rybczynski, the Stolper-Samuelson, and Leontief paradox

$p=P_M/P_F=1$	k(0)	Δk/k(0)		sigma	w(0)=w(re	w(0)/r(0)	r(0)/w(0)	k/(w/r)	α_x(w/r)
Case 1. World	6.5642		(Δ(w/r))/(w/r)		4.3652	75.49	0.0132	0.0870	6.5642
H: capital-ample country	38.6130	0.0000	0.0000	#DIV/0!	8.7532	239.11	0.0042	0.1615	38.6130
F: labour-ample country	4.1519	0.0000	0.0000	#DIV/0!	4.0349	55.52	0.0180	0.0748	4.1519
								=α/(1-α)=α_x	=k(0)
Case 2. World	6.5642				3.0987	19.32	0.0518	0.3398	1.9414
H: capital-ample country	11.6076	-0.6994	(0.9192)	-0.7609	3.0987	19.32	0.0518	0.6008	2.0302
F: labour-ample country	5.5820	0.3444	(0.6520)	0.5283	3.0987	19.32	0.0518	0.2889	1.9215
Case 3. World	7.4446				5.3210	57.07	0.0175	0.1305	5.4836
H: capital-ample country	13.2658	-0.6564	(0.7613)	-0.8622	5.3210	57.07	0.0175	0.2325	4.8741
F: labour-ample country	6.3109	0.5200	0.0279	-18.6367	5.3210	57.07	0.0175	0.1106	5.6169

Note: When the effective labour is used, the current wage rate and the profit rate are connected with *k*(0).

$r=(y_FP_F-y_HP_H)/(\Omega_Fy_F-\Omega_Hy_H)$ $w=(y_Fy_H(\Omega_HP_F-\Omega_FP_H))/(\Omega_Hy_H-\Omega_Fy_F)$

9. Introduction of relative price level, $p=P_H/P_F$: Duality [Jones, R. W., 1965] S-Samuelson [1941]

$r_F=r_F(0)=\partial Y_F/\partial K_F$ $r_H(0)_{nominal}=p\cdot(\partial Y_H/\partial K_H)$, where $p=P_H/P_F$ $w_F=w_F(0)=\partial Y_F/\partial L_F$ $w_{H(0)nominal}=p\cdot(\partial Y_H/\partial L_H)$

	Marginal productivity	$r_{H(marg.pro.)}$	$r_{F(margi.Pro.)}$	$w_{H(margi.Pro.}$	$w_{F(matgi.pro.)}$	P_H	P_F	$p=P_H/P_F$	Changes (%)
Case 1.	Total	0.05782		4.3652		1.0000		1.0000	for r & w
	H: capital-goods	0.03661		8.7532		1		1	4.7927
	F: consumption-goods		0.07268		4.0349		1		2.5467
Case 2.	Total	0.18560		3.5856		0.8642		0.8642	2.2069
	H: capital-goods	**0.17545**		3.3896		0.9142		0.9142	1.2829
	F: consumption-goods		0.16039		3.0987		1		0.3872
Case 3.	Total	0.09324		5.3209		1.0000		1.0000	0.6078
	H: capital-goods	0.09323		5.3205		1.0001		1.0001	0.7680
	F: consumption-goods		0.09324		**5.3210**		1		1.3187

T5 Case 1. Both regions have different rates of profit and the wage rates **Uzawa [1962]: $\Omega_H > \Omega_F$**

Country=capital-goods+consumption-goods: T=H+F $A(0)=k(0)^{1-\alpha}/\Omega(0)$

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5652	6152	616	316	4.0295
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08127	1.59558	0.05094	7.5799	4.7506	0.10013	0.6000	0.05400	0.04876	0.05137	4.3645
H: capital-goods		0.39	s=S/Y	0.10013	0.273	0.273		0.429		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	129.67	3828.24	95.55	41	136.50	1543.00	1679.50	264.26	168.71	9.8369
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.08127	2.27940	0.03566	29.5233	12.9522	0.15735	0.7000	0.10651	0.05689	0.10046	11.8996
F: consumption-goods			1-s	0.89987						
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1165.33	5987.76	204.45	159.05	363.50	4109.00	4472.50	351.74	147.29	3.3599
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.08127	1.33879	0.06071	5.1382	3.8380	0.07864	0.5624	0.03451	0.04571	0.03293	3.5260
Cases correspond with Heckscher-Ohlin by region.							$Y_{H(0)}/Y_{F(0)}$	0.37552		

1. Basic variables and parameters under convergence (*delta=alpha*)

	$g_Y{}^*=g_K{}^*$	$g_A{}^*$	$g_y{}^*$	Ω^*	r^*	i	$\beta^*_{(\delta=\alpha)}$	n	α
Case 1. Total	0.0386	0.0283	0.0308	1.5956	0.0509	0.08986	0.6851	0.00755	0.08127
H: capital-goods	0.0452	0.0343	0.0373	2.2794	0.0357	0.13726	0.7501	0.00755	0.08127
F: consumption-goo	0.0351	0.0251	0.0273	1.3388	0.0607	0.07206	0.6517	0.00755	0.08127
Case 2. Total	0.0386	0.0283	0.0308	1.5956	0.0509	0.08986	0.6851	0.00755	0.08127
H: capital-goods	0.0441	0.0329	0.0363	1.8026	0.0509	0.11240	0.7070	0.00755	0.09182
F: consumption-goo	0.0362	0.0263	0.0285	1.5166	0.0509	0.08126	0.6765	0.00755	0.07725
Case 3. Total	0.0387	0.0284	0.0309	1.6080	0.0509	0.09056	0.6868	0.00755	0.08191
H: capital-goods	0.0560	0.0409	0.0481	3.0453	0.0491	0.21148	0.8065	0.00755	0.14946
F: consumption-goo	0.0306	0.0214	0.0229	1.2353	0.0521	0.05920	0.6384	0.00755	0.06439

2. Basic variables and parameters under the current situation (*delta>alpha*)

	$g_{Y(a)}$	$g_{K(a)}$	$g_{A(a)}$	$g_{y(a)}$	delta	$\beta_{actual\ (\delta>\alpha)}$	$\beta^*-\beta$	$k(0)$	$y(0)$
Case 1. Total	0.0800	0.3000	0.0487	0.0718	0.1146	0.42042	0.2647	7.5799	4.7506
H: capital-goods	0.0400	0.4000	0.0289	0.0322	0.1087	0.76873	-0.0186	29.5233	12.9522
F: consumption-goo	-0.0122	0.1272	-0.0294	-0.0196	0.1188	1.43449	-0.7828	5.1382	3.8380
For min capital-goods growth		0.0509							
Case 2. Total	0.0800	0.3000	0.0487	0.0718	0.1146	0.42042	0.2647	7.5799	4.7506
H: capital-goods	0.0400	0.4000	-0.0036	0.0322	0.0650	1.02929	-0.3223	23.6186	13.1027
F: consumption-goo	-0.0135	0.1459	-0.0318	-0.0209	0.1374	1.43452	-0.7580	5.7953	3.8212
Case 3. Total	0.0800	0.3000	0.0485	0.0718	0.1115	0.43138	0.2554	7.5799	4.7139
H: capital-goods	0.0400	0.4000	-0.0262	0.0322	-0.2120	1.04595	-0.2394	15.5492	5.1059
F: consumption-goo	0.0456	0.2326	0.0236	0.0378	0.2233	0.47508	0.1634	5.7092	4.6218

$g_{A(a)}=g_{Y(a)}-\alpha g_{K(a)}-(1-\alpha)n$ delta=(n+α(i-iβ*-n))/(i(1-β*)) $\beta_{actual(\delta>\alpha)}=1-((1/i)(g_{A(a)}k(0)^{\wedge}(\delta-\alpha))$

3. Relationships between quantities: K_H & K_F and L_H & L_F

$K=(a_{KH}\cdot y_H)L_H+(a_{KF}\cdot y_F)L_F$ $L=(a_{LH}\cdot y_H)L_H+(a_{LF}\cdot y_F)L_F$

Heckscher-Ohlin $K=a_{KH}\cdot Y_H+a_{KF}\cdot Y_F$ $L=a_{LH}\cdot Y_H+a_{LF}\cdot Y_F$

For K, $a_{KH}=\Omega_H$ $a_{KF}=\Omega_F$ y_H $a_{LH}=1/y_H$

For L, $a_{LH}=1/y_H$ $a_{LF}=1/y_F$

		$a_{KH}=\Omega_H$	$a_{KF}=\Omega_F$	y_F	$a_{LF}=1/y_F$	L_H & L_F	Y_H & Y_F	$K=K_H+K_F$	$L=L_H+L_F$
Case 1.	Total	1.5956		4.7506	0.21050	1295	6152	9816	1295
	H: capital-goods	2.2794		12.9522	**0.07721**	129.67	1679.50	3828	130
	F: consumption-goods		1.3388	3.8380	**0.26055**	1165.33	4472.50	5988	1165
Case 2.	Total	1.5956		4.7506	0.21050	1295	6152	9816	1295
	H: capital-goods	1.8026		13.1027	**0.07632**	129.67	1699.00	3063	130
	F: consumption-goods		1.5166	3.8212	**0.26170**	1165.33	4453.00	6753	1165
Case 3.	Total	1.6080		4.7139	0.21214	1295	6104	9816	1295
	H: capital-goods	3.0453		5.1059	**0.19585**	246.20	1257.09	3828	246
	F: consumption-goods		1.2353	4.6218	**0.21636**	1048.80	4847.39	5988	1049

T5 Case 2. K decreases in capital-goods by 20% **Uzawa [1962]**

Country=capital-goods+consumption-goods: T=H+F | $\Delta Y(0)/Y(0)$ 0.00000 | $A(0)=k(0)^{1-\alpha}/\Omega(0)$

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5652	6152	616	316	4.0295
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08127	1.59558	0.05094	7.5799	4.7506	0.10013	0.6000	0.05400	0.04876	0.05137	4.3645

H: capital-goods | ΔK/K: -0.2 | $\Delta Y_{H(0)}/Y_{H(0)}$ 0.01162

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	129.67	3062.59	109.21	47	**156.01**	1543.00	1699.00	211.41	102.21	9.8008
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.09182	1.80258	**0.05094**	23.6186	13.1027	0.12443	0.7000	0.06429	0.06428	0.06016	11.8996

F: consumption-goods Using goal seek, where r_H approaches $r=r_F$ | $\Delta Y_{F(0)}/Y_{F(0)}$ -0.00436

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1165.33	6753.41	190.79	153.20	343.99	4109.00	4453.00	404.59	213.79	3.3362
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.07725	1.51660	0.05094	5.7953	3.8212	0.09086	0.5546	0.05016	0.04285	0.04801	3.5260

$Y_{H(0)}/Y_{F(0)}$ 0.38154 **Uzawa [1962]: $\Omega_H>\Omega_F$**

4. The Penrose curve, B_K, and the assets valuation ratio, v

		Ω^*	I/K	$g_K{}^*$	Slope B_K	r^*	r_{M^*}	Slope A	Slope B_K/A	$v=1/\beta^*$
Case 1.	Total	1.5956	0.0563	0.0386	1.4597	0.0509	0.0349	1.4597	1.0000	1.4597
H: capital-goods		2.2794	0.0602	0.0452	1.3332	0.0357	0.0267	1.3332	1.0000	1.3332
F: consumption-goo		1.3388	0.0538	0.0351	1.5345	0.0607	0.0396	1.5345	1.0000	1.5345
Case 2.	Total	1.5956	0.0563	0.0386	1.4597	0.0509	0.0349	1.4597	1.0000	1.4597
H: capital-goods		1.8026	0.0624	0.0456	1.3673	0.0509	0.0373	1.3673	1.0000	1.4144
F: consumption-goo		1.5166	0.0536	0.0350	1.5328	0.0509	0.0332	1.5328	1.0000	1.4781
Case 3.	Total	1.6080	0.0563	0.0386	1.4589	0.0513	0.0352	1.4589	1.0000	1.4561
H: capital-goods		3.0453	0.0694	0.0482	1.4413	0.0491	0.0341	1.4413	1.0000	1.2399
F: consumption-goo		1.2353	0.0479	0.0346	1.3859	0.0521	0.0376	1.3859	1.0000	1.5663

5. The relative price level: real vs. nominal

					(a)	Inf. or def	(b)		(c)	
		$r(0)$	$r=\partial Yt/\partial Kt$	$P_Y=r(0)/r_{real}$	$r_{M(0)\ given}$	$p_Y=r_{M(0)}/r_{rea}$	$r_M{}^*$ at β^*	(a)/(b)	r_{CB} goal see	(a)/(c)
Case 1.	Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0349	0.9457	0.0317	1.0394
H: capital-goods		0.03566	0.03566	1.0000	0.0330	0.9255	0.0267	1.2339	0.0243	1.3572
F: consumption-goo		0.06071	0.06071	1.0000	0.0330	0.5436	0.0396	0.8342	0.0359	0.9182
Case 2.	Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0349	0.9457	0.0317	1.0407
H: capital-goods		0.05094	0.05094	1.0000	0.0330	0.6478	0.0360	0.9163	0.0263	1.2544
F: consumption-goo		0.05094	0.05094	1.0000	0.0330	0.6479	0.0345	0.9576	0.0331	0.9963
Case 3.	Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0353	0.9361	0.0320	1.0304
H: capital-goods		0.04908	0.04908	1.0000	0.0330	0.6724	0.0396	0.8337	0.0309	1.0689
F: consumption-goo		0.05213	0.05213	1.0000	0.0330	0.6331	0.0333	0.9916	0.0320	1.0318

Note: If the price level of output, P_Y, is one, real=nominal and the elasticity of substitution, σ, is always 1.0.

$r(real)=\partial Yt/\partial Kt=\alpha AtKt^{\alpha-1}Lt^{1-\alpha}$ and $w(real)=\partial Yt/\partial Lt=(1-\alpha)AtKt^{\alpha}Lt^{-\alpha}$

6. Relationships between price levels: r_H & w_H for P_H and r_F & w_F for P_F **Rybczynski**

For H, $P_H=a_{KH}.r_H+a_{LH}.w_H$ When real=nominal, the price level is 1.0. The elasticity of substitution is 1.0.

For F, $P_F=a_{KF}.r_F+a_{LF}.w_F$

		r_H	r_F	w_H	w_F	P_H	P_F	$p=P_H/P_F$
Case 1.	Total	0.05094		4.3645		1.0000		1.0000
	H: capital-goods	0.03566		11.8996		1		1
	F: consumption-goods		0.06071		3.5260		1	
Case 2.	Total	0.05094		4.3645		1.0000		1.0000
	H: capital-goods	0.05094		11.8996		1		1
	F: consumption-goods		0.05094		3.5260		1	
Case 3.	Total	0.05094		4.3278		1.0000		1.0000
	H: capital-goods	0.04908		4.3428		1		1
	F: consumption-goods		0.05213		4.3243		1	

T5 Case 3. L decreases in consumption-goods by 10% **Uzawa [1962]**

Country=capital-goods+consumption-goods: T=H+F — $\Delta Y(0)/Y(0)$ = -0.00773 — $A(0)=k(0)^{1-\alpha}/\Omega(0)$

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5604	6104	616	316	3.9933
α	$\Omega(0)$	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08191	1.60800	0.05094	7.5799	4.7139	0.10091	0.6000	0.05444	0.04914	0.05177	4.3278

H: capital-goods — $\Delta Y_{H(0)}/Y_{H(0)}$ = -0.25151

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	246.20	3828.24	131.52	56	187.88	**1069.21**	1257.09	299.44	167.92	3.3882
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.14946	3.04532	0.04908	15.5492	5.1059	0.23820	0.7000	0.14919	0.10462	0.13358	**4.3428**

F: consumption-goods — $\Delta L/L$: -0.1 — $\Delta Y_{F(0)}/Y_{F(0)}$ = 0.08382

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1048.80	5987.76	168.48	143.64	312.12	**4535.27**	4847.39	316.56	148.08	4.1314
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.06439	1.23526	0.05213	5.7092	4.6218	0.06531	0.5398	0.03165	0.03476	0.03055	**4.3243**

$Y_{H(0)}/Y_{F(0)}$ = 0.25933 — $\mathbf{\Omega_{H(0)}>\Omega_{F(0)}}$

Using goal seek, where w_F approaches $w=w_H$

7. The neutrality of financial assets and the coeffcient *x=r/w*

$ke^*=\Omega^*$^(1/(1−α)) — $x_e^*/x_0=k(0)/ke^*$

	r_{CB} goal see	r_M^* at β^*	r^*/r_{M^*}	$c_{CB}=r_M^*/r_{CB}$	α_x	$x_0=\alpha_x/k(0$	ke*	$x_e^*=\alpha_x/ke^*$	x_0/x_e^*
Case 1. Total	0.0317	0.0349	1.4597	1.09913	0.0885	0.0117	1.6629	0.0532	0.2194
H: capital-goods	0.0243	0.0267	1.3332	1.09993	0.0885	0.0030	2.4517	0.0361	0.0830
F: consumption-goo	0.0359	0.0396	1.5345	1.10070	0.0885	0.0172	1.3738	0.0644	0.2674
	goal seek			**goal seek**	$\alpha_x=\alpha/(1-\alpha)$				
Case 2. Total	0.0317	0.0349	1.4597	1.10047	0.0885	0.0117	1.6629	0.0532	0.2194
H: capital-goods	0.0263	0.0360	1.3673	1.41614	0.1011	0.0037	1.9132	0.0528	0.0709
F: consumption-goo	0.0331	0.0345	1.5328	1.00332	0.0837	0.0153	1.5704	0.0533	0.2863
Case 3. Total	0.0320	0.0353	1.4589	1.09871	0.0892	0.0117	1.6776	0.0532	0.2195
H: capital-goods	0.0309	0.0396	1.4413	1.10290	0.1757	0.0057	3.7035	0.0474	0.1199
F: consumption-goo	0.0320	0.0333	1.3859	1.17601	0.0688	0.0155	1.2533	0.0549	0.2822

Note: When the effective labour is used, the coefficient, x_0 and x_e, are connected with $ke(0)$ (see also below).

8. Data for the Heckshser-Ohlin, Rybczynski, the Stolper-Samuelson, and Leontief paradox

$\mathbf{p}=P_M/P_F=1$	k(0)	$\Delta k/k(0)$		*sigma*	w(0)=w(re	w(0)/r(0)	r(0)/w(0)	k/(w/r)	α_x(w/r)
Case 1. Total	7.5799		(Δ(w/r)/(w/r)		4.3645	85.68	0.0117	0.0885	7.5799
H: capital-goods	29.5233	0.0000	0.0000	#DIV/0!	11.8996	333.73	0.0030	0.0885	29.5233
F: consumption-goo	5.1382	0.0000	0.0000	#DIV/0!	3.5260	58.08	0.0172	0.0885	5.1382
								$=\alpha/(1-\alpha)=\alpha_x$	=k(0)
Case 2. Total	7.5799				4.3645	85.68	0.0117	0.0885	7.5799
H: capital-goods	23.6186	-0.2000	(0.3000)	-0.6666	11.8996	233.60	0.0043	0.1011	23.6186
F: consumption-goo	5.7953	0.1279	0.1918	-0.6666	3.5260	69.22	0.0144	0.0837	5.7953
Case 3. Total	7.5799				4.3278	84.96	0.0118	0.0892	7.5799
H: capital-goods	15.5492	-0.4733	(0.7348)	-0.6441	4.3428	88.49	0.0113	0.1757	15.5492
F: consumption-goo	5.7092	0.1111	0.4283	-0.2594	4.3243	82.96	0.0121	0.0688	5.7092

Note: When the effective labour is used, the current wage rate and the profit rate are connected with $k(0)$.

Rybczenski [1955] only holds under the condition of H-O.

9. Introduction of relative price level, *p=P_H/P_F*: Duality [Jones, R. W., 1965] **S-Samuelson [1941]**

$r_F=r_F(0)=\partial Y_F/\partial K_F$ $r_H(0)_{nominal}=\mathbf{p}\cdot(\partial Y_H/\partial K_H)$, where $\mathbf{p}=P_H/P_F$ $w_F=w_F(0)=\partial Y_F/\partial L_F$ $w_{H(0)nominal}=\mathbf{p}\cdot(\partial Y_H/\partial L_H)$

	Marginal productivity	$r_{H(marg.pro.)}$	$r_{F(margi.Pro.)}$	$w_{H(margi.Pro.)}$	$w_{F(matgi.pro.)}$	P_H	P_F	$p=P_H/P_F$	Changes (%)
Case 1.	Total	0.05094		4.3645					for r & w
	H: capital-goods	0.03566		11.8996		1		1	1.4286
	F: consumption-goods		0.06071		3.5260		1		1.3764
Case 2.	Total	0.05094		4.3645					0.8390
	H: capital-goods	**0.05094**		11.8996		1		1.0000	0.8587
	F: consumption-goods		0.05094		3.5260		1.0000		1.0000
Case 3.	Total	0.05094		4.3278					0.3650
	H: capital-goods	0.04908		4.3428		1.0000		1.0000	1.0000
	F: consumption-goods		0.05213		**4.3243**		1.0000		1.2264

T6 Case 1. Both regions have different rates of profit and the wage rates **Uzawa [1962]**

Country=capital-goods+consumption-goods: T=H+F $A(0)=k(0)^{1-\alpha}/\Omega(0)$

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5652	6152	1253	953	4.0295
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08127	1.59558	0.05094	7.5799	4.7506	0.20367	0.6000	0.16285	0.04876	0.15491	4.3645
H: capital-goods		0.39	s=S/Y	0.20367	0.273	0.273		0.429		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	263.76	3828.24	95.55	41	136.50	1543.00	1679.50	537.54	441.99	5.1233
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.08127	2.27940	0.03566	14.5143	6.3676	0.32006	0.7000	0.27904	0.05689	0.26317	5.8501
F: consumption-goods			1-s	0.79633						
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1031.24	5987.76	204.45	159.05	363.50	4109.00	4472.50	715.46	511.01	3.7593
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.08127	1.33879	0.06071	5.8064	4.3370	0.15997	0.5624	0.11973	0.04571	0.11426	3.9845
Cases correspond with Hecksher-Ohlin by region.							$Y_{H(0)}/Y_{F(0)}$	0.37552		$\Omega_{H(0)}>\Omega_{F(0)}$

1. Basic variables and parameters under convergence (*delta=alpha*)

		$g_Y{}^*=g_K{}^*$	$g_A{}^*$	$g_y{}^*$	Ω^*	r^*	i	$\beta^*{}_{(\delta=\alpha)}$	n	α
Case 1.	Total	0.0716	0.0584	0.0636	1.5956	0.0509	0.17269	0.6617	0.00755	0.08127
H: capital-goods		0.0860	0.0715	0.0778	2.2794	0.0357	0.26743	0.7326	0.00755	0.08127
F: consumption-goo		0.0640	0.0515	0.0560	1.3388	0.0607	0.13712	0.6247	0.00755	0.08127
Case 2.	Total	0.0716	0.0584	0.0636	1.5956	0.0509	0.17269	0.6617	0.00755	0.08127
H: capital-goods		0.0822	0.0672	0.0740	1.8026	0.0509	0.21534	0.6877	0.00755	0.09182
F: consumption-goo		0.0671	0.0546	0.0592	1.5166	0.0509	0.15642	0.6510	0.00755	0.07725
Case 3.	Total	0.0700	0.0573	0.0620	1.4994	0.0509	0.16229	0.6471	0.00755	0.07638
H: capital-goods		0.0957	0.0787	0.0875	2.0444	0.0491	0.27426	0.7131	0.00755	0.10033
F: consumption-goo		0.0564	0.0452	0.0485	1.2811	0.0521	0.11743	0.6149	0.00755	0.06678

2. Basic variables and parameters under the current situation (*delta>alpha*)

		$g_{Y(a)}$	$g_{K(a)}$	$g_{A(a)}$	$g_{y(a)}$	*delta*	$\beta_{actual\ (\delta>\alpha)}$	$\beta^*-\beta$	$k(0)$	$y(0)$
Case 1.	Total	0.0800	0.3000	0.0487	0.0718	0.0974	0.70873	-0.0470	7.5799	4.7506
H: capital-goods		0.0400	0.4000	0.0289	0.0322	0.0944	0.88795	-0.1553	14.5143	6.3676
F: consumption-goo		0.0393	0.1079	0.0236	0.0315	0.0996	0.82240	-0.1977	5.8064	4.3370
For min capital-goods growth			0.0509							
Case 2.	Total	0.0800	0.3000	0.0487	0.0718	0.0974	0.70873	-0.0470	7.5799	4.7506
H: capital-goods		0.0400	0.4000	-0.0036	0.0322	0.0787	1.01611	-0.3284	11.6114	6.4415
F: consumption-goo		0.0389	0.1145	0.0231	0.0311	0.1062	0.84438	-0.1933	6.5488	4.3181
Case 3.	Total	0.0800	0.3000	0.0501	0.0718	0.1063	0.67190	-0.0248	7.5799	5.0552
H: capital-goods		0.0400	0.4000	-0.0069	0.0322	0.0683	1.02342	-0.3103	10.4345	5.1041
F: consumption-goo		0.0474	0.1436	0.0307	0.0395	0.1351	0.70259	-0.0877	6.4515	5.0358

$g_{A(a)}=g_{Y(a)}-\alpha g_{K(a)}-(1-\alpha)n$ delta=(n+α(i-iβ*-n))/(i(1-β*)) $\beta_{actual(\delta>\alpha)}=1-((1/i)(g_{A(a)}k(0)^\wedge(\delta-\alpha))$

Hecksher-Ohlin

3. Relationships between quantities: K_H & K_F and L_H & L_F $K=(a_{KH}\cdot y_H)L_H+(a_{KF}\cdot y_F)L_F$ $K=a_{KH}\cdot Y_H+a_{KF}\cdot Y_F$

$L=(a_{LH}\cdot y_H)L_H+(a_{LF}\cdot y_F)L_F$ $L=a_{LH}\cdot Y_H+a_{LF}\cdot Y_F$

For K,	$a_{KH}=\Omega_H$ $a_{KF}=\Omega_F$			y_H	$a_{LH}=1/y_H$				
For L,	$a_{LH}=1/y_H$ $a_{LF}=1/y_F$	$a_{KH}=\Omega_H$	$a_{KF}=\Omega_F$	y_F	$a_{LF}=1/y_F$	L_H &L_F	Y_H &Y_F	$K=K_H+K_F$	$L=L_H+L_F$
Case 1.	Total	1.5956		4.7506	0.21050	1295	6152	9816	1295
	H: capital-goods	2.2794		6.3676	**0.15705**	263.76	1679.50	3828	264
	F: consumption-goods		1.3388	4.3370	**0.23057**	1031.24	4472.50	5988	1031
Case 2.	Total	1.5956		4.7506	0.21050	1295	6152	9816	1295
	H: capital-goods	1.8026		6.4415	**0.15524**	263.76	1699.00	3063	264
	F: consumption-goods		1.5166	4.3181	**0.23158**	1031.24	4453.00	6753	1031
Case 3.	Total	1.4994		5.0552	0.19782	1295	6546	9816	1295
	H: capital-goods	2.0444		5.1041	**0.19592**	366.88	1872.59	3828	367
	F: consumption-goods		1.2811	5.0358	**0.19858**	928.12	4673.83	5988	928

T6 Case 2. K decreases in capital-goods by 20% **Uzawa [1962]: $\Omega_H > \Omega_F$**

Country=capital-goods+consumption-goods: T=H+F

$\Delta Y(0)/Y(0)$ 0.00000 $A(0)=k(0)^{1-\alpha}/\Omega(0)$

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5652	6152	1253	953	4.0295
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08127	1.59558	0.05094	7.5799	4.7506	0.20367	0.6000	0.16285	0.04876	0.15491	4.3645

H: capital-goods $\Delta K/K$: -0.2 $\Delta Y_{H(0)}/Y_{H(0)}$ 0.01162

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	263.76	3062.59	109.21	47	**156.01**	1543.00	1699.00	430.03	320.82	5.1429
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.09182	1.80258	**0.05094**	11.6114	6.4415	0.25311	0.7000	0.20180	0.06428	0.18883	5.8501

F: consumption-goods Using goal seek, where r_H approaches $r=r_F$ $\Delta Y_{F(0)}/Y_{F(0)}$ -0.00436

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1031.24	6753.41	190.79	153.20	343.99	4109.00	4453.00	822.97	632.18	3.7346
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.07725	1.51660	0.05094	6.5488	4.3181	0.18481	0.5546	0.14832	0.04285	0.14197	3.9845

$Y_{H(0)}/Y_{F(0)}$ 0.38154

4. The Penrose curve, B_K, and the assets valuation ratio, v

		Ω^*	I/K	g_K^*	Slope B_K	r^*	r_{M^*}	Slope A	Slope B_K/A	$v=1/\beta^*$
Case 1.	Total	1.5956	0.1082	0.0716	1.5113	0.0509	0.0337	1.5113	1.0000	1.5113
H: capital-goods		2.2794	0.1173	0.0860	1.3649	0.0357	0.0261	1.3649	1.0000	1.3649
F: consumption-goo		1.3388	0.1024	0.0640	1.6007	0.0607	0.0379	1.6007	1.0000	1.6007
Case 2.	Total	1.5956	0.1082	0.0716	1.5113	0.0509	0.0337	1.5113	1.0000	1.5113
H: capital-goods		1.8026	0.1195	0.0869	1.3752	0.0509	0.0370	1.3752	1.0000	1.4541
F: consumption-goo		1.5166	0.1031	0.0637	1.6182	0.0509	0.0315	1.6182	1.0000	1.5360
Case 3.	Total	1.4994	0.1082	0.0713	1.5185	0.0479	0.0315	1.5185	1.0000	1.5455
H: capital-goods		2.0444	0.1342	0.0876	1.5311	0.0491	0.0321	1.5311	1.0000	1.4023
F: consumption-goo		1.2811	0.0917	0.0631	1.4525	0.0521	0.0359	1.4525	1.0000	1.6262

5. The relative price level: real vs. nominal

					(a)	Inf. or def	(b)		(c)	
		$r(0)$	$r=\partial Yt/\partial Kt$	$P_Y=r(0)/r_{real}$	$r_{M(0)\ given}$	$p_Y=r_{M(0)}/r_{rea}$	r_M^* at β^*	(a)/(b)	r_{CB} goal see	(a)/(c)
Case 1.	Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0337	0.9791	0.0306	1.0770
H: capital-goods		0.03566	0.03566	1.0000	0.0330	0.9255	0.0261	1.2632	0.0334	0.9891
F: consumption-goo		0.06071	0.06071	1.0000	0.0330	0.5436	0.0379	0.8702	0.0293	1.1273
Case 2.	Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0337	0.9791	0.0306	1.0779
H: capital-goods		0.05094	0.05094	1.0000	0.0330	0.6478	0.0350	0.9420	0.0275	1.1999
F: consumption-goo		0.05094	0.05094	1.0000	0.0330	0.6479	0.0332	0.9951	0.0319	1.0344
Case 3.	Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0310	1.0654	0.0309	1.0670
H: capital-goods		0.04908	0.04908	1.0000	0.0330	0.6724	0.0350	0.9429	0.0314	1.0509
F: consumption-goo		0.05213	0.05213	1.0000	0.0330	0.6331	0.0321	1.0295	0.0310	1.0644

Note: If the price level of output, P_Y, is one, real=nominal and the elasticity of substitution, σ, is always 1.0.

$r(real)=\partial Yt/\partial Kt=\alpha AtKt^{\wedge \alpha-1}Lt^{1-\alpha}$ and $w(real)=\partial Yt/\partial Lt=(1-\alpha)AtKt^{\alpha}Lt^{-\alpha}$

6. Relationships between price levels: r_H & w_H for P_H and r_F & w_F for P_F **Rybczynski**

For H, $P_H=a_{KH}.r_H+a_{LH}.w_H$ When real=nominal, the price level is 1.0. The elasticity of substitution is 1.0.

For F, $P_F=a_{KF}.r_F+a_{LF}.w_F$

		r_H	r_F	w_H	w_F	P_H	P_F	$p=P_H/P_F$
Case 1.	Total	0.05094		4.3645		1.0000		1.0000
	H: capital-goods	0.03566		5.8501		1		1
	F: consumption-goods		0.06071		3.9845		1	
Case 2.	Total	0.05094		4.3645		1.0000		1.0000
	H: capital-goods	0.05094		5.8501		1		1
	F: consumption-goods		0.05094		3.9845		1	
Case 3.	Total	0.05094		4.6691		1.0000		1.0000
	H: capital-goods	0.04908		4.5920		1		1
	F: consumption-goods		0.05213		4.6995		1	

T6 Case 3. L decreases in consumption-goods by 10% **Uzawa [1962]**

Country=capital-goods+consumption-goods: T=H+F							$\Delta Y(0)/Y(0)$	0.06411	$A(0)=k(0)^{1-\alpha}/\Omega(0)$	
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	6046	6546	1253	953	4.3306
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.07638	1.49945	0.05094	7.5799	5.0552	0.19140	0.6000	0.15257	0.04583	0.14558	4.6691
H: capital-goods							$\Delta Y_{H(0)}/Y_{H(0)}$	0.11497		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	366.88	3828.24	131.52	56	187.88	**1684.71**	1872.59	609.08	477.57	4.0340
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.10033	2.04436	0.04908	10.4345	5.1041	0.32526	0.7000	0.27429	0.07023	0.25503	**4.5920**
F: consumption-goods			ΔL/L:	-0.1			$\Delta Y_{F(0)}/Y_{F(0)}$	0.04501		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	928.12	5987.76	168.48	143.64	312.12	**4361.71**	4673.83	643.92	475.43	4.4463
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.06678	1.28112	0.05213	6.4515	5.0358	0.13777	0.5398	0.10553	0.03605	0.10172	**4.6995**
							$Y_{H(0)}/Y_{F(0)}$	0.40065		$\mathbf{\Omega_{H(0)}>\Omega_{F(0)}}$

Using goal seek, where w_F approaches $w=w_H$

7. The neutrality of financial assets and the coeffcient *x=r/w*

ke*=Ω*^(1/(1−α)) $x_e^*/x_0=k(0)/ke^*$

	r_{CB} goal see	r_M^* at β^*	r^*/r_{M^*}	$c_{CB}=r_M^*/r_{CB}$	α_x	$x_0=\alpha_x/k(0$	ke*	$x_e^*=\alpha_x/ke^*$	x_0/x_e^*
Case 1. Total	0.0306	0.0337	1.5113	1.09997	0.0885	0.0117	1.6629	0.0532	0.2194
H: capital-goods	0.0334	0.0261	1.3649	0.78303	0.0885	0.0061	2.4517	0.0361	0.1689
F: consumption-goo	0.0293	0.0379	1.6007	1.29555	0.0885	0.0152	1.3738	0.0644	0.2366
	goal seek			**goal seek**	$\alpha_x=\alpha/(1-\alpha)$				
Case 2. Total	0.0306	0.0337	1.5113	1.10094	0.0885	0.0117	1.6629	0.0532	0.2194
H: capital-goods	0.0275	0.0350	1.3752	1.34683	0.1011	0.0076	1.9132	0.0528	0.1442
F: consumption-goo	0.0319	0.0332	1.6182	0.98664	0.0837	0.0135	1.5704	0.0533	0.2534
Case 3. Total	0.0309	0.0310	1.5185	1.01926	0.0827	0.0117	1.5505	0.0533	0.2188
H: capital-goods	0.0314	0.0350	1.5311	1.02071	0.1115	0.0085	2.2141	0.0504	0.1683
F: consumption-goo	0.0310	0.0321	1.4525	1.15752	0.0716	0.0137	1.3040	0.0549	0.2499

Note: When the effective labour is used, the coefficient, x_0 and x_e, are connected with *ke*(0) (see also below).

8. Data for the Heckshער-Ohlin, Rybczynski, the Stolper-Samuelson, and Leontief paradox

$p=P_M/P_F=1$	k(0)	Δk/k(0)		*sigma*	w(0)=w(re	w(0)/r(0)	r(0)/w(0)	k/(w/r)	α_x(w/r)
Case 1. Total	7.5799		(Δ(w/r)/(w/r)		4.3645	85.68	0.0117	0.0885	7.5799
H: capital-goods	14.5143	0.0000	0.0000	#DIV/0!	5.8501	164.07	0.0061	0.0885	14.5143
F: consumption-goo	5.8064	0.0000	0.0000	#DIV/0!	3.9845	65.64	0.0152	0.0885	5.8064
								=α/(1-α)=α_x	=k(0)
Case 2. Total	7.5799				4.3645	85.68	0.0117	0.0885	7.5799
H: capital-goods	11.6114	-0.2000	(0.3000)	-0.6666	5.8501	114.84	0.0087	0.1011	11.6114
F: consumption-goo	6.5488	0.1279	0.1918	-0.6666	3.9845	78.23	0.0128	0.0837	6.5488
Case 3. Total	7.5799				4.6691	91.66	0.0109	0.0827	7.5799
H: capital-goods	10.4345	-0.2811	(0.4297)	-0.6541	4.5920	93.57	0.0107	0.1115	10.4345
F: consumption-goo	6.4515	0.1111	0.3736	-0.2974	4.6995	90.16	0.0111	0.0716	6.4515

Note: When the effective labour is used, the current wage rate and the profit rate are connected with *k*(0).

Rybczenski [1955] only holds under the condition of H-O.

9. Introduction of relative price level, $p=P_H/P_F$: Duality [Jones, R. W., 1965] **S-Samuelson [1941]**

$r_F=r_F(0)=\partial Y_F/\partial K_F$ $r_H(0)_{nominal}=p\cdot(\partial Y_H/\partial K_H)$, where $p=P_H/P_F$ $w_F=w_F(0)=\partial Y_F/\partial L_F$ $w_{H(0)nominal}=p\cdot(\partial Y_H/\partial L_H)$

	Marginal productivity	$r_{H(marg.pro.)}$	$r_{F(margi.Pro.)}$	$w_{H(margi.Pro.}$	$w_{F(matgi.pro.)}$	P_H	P_F	$p=P_H/P_F$	Changes (%)
Case 1.	Total	0.05094		4.3645					for r & w
	H: capital-goods	0.03566		5.8501		1		1	1.4286
	F: consumption-goods		0.06071		3.9845		1		1.3764
Case 2.	Total	0.05094		4.3645					0.8390
	H: capital-goods	**0.05094**		5.8501		1		1.0000	0.8587
	F: consumption-goods		0.05094		3.9845		1.0000		1.0000
Case 3.	Total	0.05094		4.6691					0.7849
	H: capital-goods	0.04908		4.5920		1.0000		1.0000	1.0000
	F: consumption-goods		0.05213		**4.6995**		1.0000		1.1794

T7 Case 1. Both regions have different rates of profit and the wage rates **Uzawa [1962]**

Country=capital-goods+consumption-goods: T=H+F $A(0)=k(0)^{1-\alpha}/\Omega(0)$

n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5652	6152	1850	1550	4.0295
α	Ω(0)	r(0)	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08127	1.59558	0.05094	7.5799	4.7506	0.30072	0.6000	0.26487	0.04876	0.25195	4.3645
H: capital-goods		0.39	s=S/Y	0.30072	0.273	0.273		0.429		
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	389.43	3828.24	95.55	41	136.50	1543.00	1679.50	793.65	698.10	3.5816
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.08127	2.27940	0.03566	9.8305	4.3127	0.47255	0.7000	0.44073	0.05689	0.41566	3.9622
F: consumption-goods			1-s	0.69928						
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	905.57	5987.76	204.45	159.05	363.50	4109.00	4472.50	1056.35	851.90	4.2360
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.08127	1.33879	0.06071	6.6121	4.9389	0.23619	0.5624	0.19960	0.04571	0.19047	4.5375
Cases correspond with Hecksher-Ohlin by region.							$Y_{H(0)}/Y_{F(0)}$	0.37552		$\boldsymbol{\Omega_{H(0)}>\Omega_{F(0)}}$

1. Basic variables and parameters under convergence (*delta=alpha*)

		$g_Y{}^*=g_K{}^*$	$g_A{}^*$	$g_y{}^*$	Ω^*	r^*	i	$\beta^*{}_{(\delta=\alpha)}$	n	α
Case 1.	Total	0.1026	0.0867	0.0943	1.5956	0.0509	0.25033	0.6538	0.00755	0.08127
H: capital-goods		0.1242	0.1064	0.1158	2.2794	0.0357	0.38942	0.7269	0.00755	0.08127
F: consumption-goo		0.0911	0.0762	0.0829	1.3388	0.0607	0.19809	0.6155	0.00755	0.08127
Case 2.	Total	0.1026	0.0867	0.0943	1.5956	0.0509	0.25033	0.6538	0.00755	0.08127
H: capital-goods		0.1178	0.0994	0.1095	1.8026	0.0509	0.31182	0.6812	0.00755	0.09182
F: consumption-goo		0.0961	0.0811	0.0879	1.5166	0.0509	0.22686	0.6425	0.00755	0.07725
Case 3.	Total	0.1067	0.0895	0.0984	1.7840	0.0509	0.27988	0.6803	0.00755	0.09087
H: capital-goods		0.1373	0.1160	0.1288	2.0169	0.0491	0.39289	0.7047	0.00755	0.09899
F: consumption-goo		0.0885	0.0734	0.0803	1.6613	0.0521	0.22037	0.6670	0.00755	0.08660

2. Basic variables and parameters under the current situation (*delta>alpha*)

		$g_{Y(a)}$	$g_{K(a)}$	$g_{A(a)}$	$g_{y(a)}$	*delta*	$\beta_{actual\ (\delta>\alpha)}$	$\beta^*-\beta$	$k(0)$	$y(0)$
Case 1.	Total	0.0800	0.3000	0.0487	0.0718	0.0921	0.80119	-0.1474	7.5799	4.7506
H: capital-goods		0.0400	0.4000	0.0289	0.0322	0.0901	0.92420	-0.1973	9.8305	4.3127
F: consumption-goo		0.0489	0.1019	0.0337	0.0410	0.0936	0.82598	-0.2105	6.6121	4.9389
For min capital-goods growth			0.0509							
Case 2.	Total	0.0800	0.3000	0.0487	0.0718	0.0921	0.80119	-0.1474	7.5799	4.7506
H: capital-goods		0.0400	0.4000	-0.0036	0.0322	0.0829	1.01128	-0.3301	7.8644	4.3628
F: consumption-goo		0.0487	0.1050	0.0337	0.0409	0.0967	0.84567	-0.2032	7.4576	4.9173
Case 3.	Total	0.0800	0.3000	0.0459	0.0718	0.0829	0.83870	-0.1584	7.5799	4.2489
H: capital-goods		0.0400	0.4000	-0.0064	0.0322	0.0796	1.01563	-0.3109	7.9758	3.9544
F: consumption-goo		0.0481	0.0955	0.0330	0.0403	0.0873	0.85018	-0.1831	7.3468	4.4223

$g_{A(a)}=g_{Y(a)}-\alpha g_{K(a)}-(1-\alpha)n$ delta=(n+α(i-iβ*-n))/(i(1-β*)) $\beta_{actual(\delta>\alpha)}=1-((1/i)(g_{A(a)}k(0)^{\wedge}(\delta-\alpha))$

Heckscher-Ohlin

3. Relationships between quantities: K_H & K_F and L_H & L_F

$K=(a_{KH}\cdot y_H)L_H+(a_{KF}\cdot y_F)L_F$ | $K=a_{KH}\cdot Y_H+a_{KF}\cdot Y_F$

$L=(a_{LH}\cdot y_H)L_H+(a_{LF}\cdot y_F)L_F$ | $L=a_{LH}\cdot Y_H+a_{LF}\cdot Y_F$

For K, $a_{KH}=\Omega_H$ $a_{KF}=\Omega_F$ | y_H $\mathbf{a_{LH}}=1/y_H$

For L, $a_{LH}=1/y_H$ $a_{LF}=1/y_F$ | y_F $\mathbf{a_{LF}}=1/y_F$

		$a_{KH}=\Omega_H$	$a_{KF}=\Omega_F$	y_H / y_F	$a_{LH}=1/y_H$ / $a_{LF}=1/y_F$	L_H & L_F	Y_H & Y_F	$K=K_H+K_F$	$L=L_H+L_F$
Case 1.	Total	1.5956		4.7506	0.21050	1295	6152	9816	1295
	H: capital-goods	2.2794		4.3127	**0.23187**	389.43	1679.50	3828	389
	F: consumption-goods		1.3388	4.9389	**0.20248**	905.57	4472.50	5988	906
Case 2.	Total	1.5956		4.7506	0.21050	1295	6152	9816	1295
	H: capital-goods	1.8026		4.3628	**0.22921**	389.43	1699.00	3063	389
	F: consumption-goods		1.5166	4.9173	**0.20336**	905.57	4453.00	6753	906
Case 3.	Total	1.7840		4.2489	0.23536	1295	5502	9816	1295
	H: capital-goods	2.0169		3.9544	**0.25288**	479.98	1898.05	3828	480
	F: consumption-goods		1.6613	4.4223	**0.22613**	815.02	3604.25	5988	815

T7 Case 2. K decreases in capital-goods by 20% — **Uzawa [1962]: $\Omega_H > \Omega_F$**

Country=capital-goods+consumption-goods: T=H+F							ΔY(0)/Y(0)	0.00000	$A(0)=k(0)^{1-\alpha}/\Omega(0)$	
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5652	6152	1850	1550	4.0295
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08127	1.59558	0.05094	7.5799	4.7506	0.30072	0.6000	0.26487	0.04876	0.25195	4.3645
H: capital-goods			ΔK/K:	-0.2			$\Delta Y_{H(0)}/Y_{H(0)}$	0.01162		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	389.43	3062.59	109.21	47	**156.01**	1543.00	1699.00	634.92	525.71	3.6102
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.09182	1.80258	**0.05094**	7.8644	4.3628	0.37370	0.7000	0.33068	0.06428	0.30942	3.9622
F: consumption-goods	Using goal seek, where r_H approaches $r=r_F$						$\Delta Y_{F(0)}/Y_{F(0)}$	-0.00436		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	905.57	6753.41	190.79	153.20	343.99	4109.00	4453.00	1215.08	1024.29	4.2104
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.07725	1.51660	0.05094	7.4576	4.9173	0.27287	0.5546	0.24032	0.04285	0.23002	4.5375
							$Y_{H(0)}/Y_{F(0)}$	0.38154		

4. The Penrose curve, B_K, and the assets valuation ratio, v

	Ω*	I/K	g_K*	Slope B_K	r*	r_{M^*}	Slope A	Slope B_K/A	$v=1/\beta^*$
Case 1. Total	1.5956	0.1569	0.1026	1.5294	0.0509	0.0333	1.5294	1.0000	1.5294
H: capital-goods	2.2794	0.1708	0.1242	1.3757	0.0357	0.0259	1.3757	1.0000	1.3757
F: consumption-goo	1.3388	0.1480	0.0911	1.6247	0.0607	0.0374	1.6247	1.0000	1.6247
Case 2. Total	1.5956	0.1569	0.1026	1.5294	0.0509	0.0333	1.5294	1.0000	1.5294
H: capital-goods	1.8026	0.1730	0.1255	1.3779	0.0509	0.0370	1.3779	1.0000	1.4680
F: consumption-goo	1.5166	0.1496	0.0907	1.6491	0.0509	0.0309	1.6491	1.0000	1.5565
Case 3. Total	1.7840	0.1569	0.1036	1.5146	0.0570	0.0376	1.5146	1.0000	1.4700
H: capital-goods	2.0169	0.1948	0.1265	1.5402	0.0491	0.0319	1.5402	1.0000	1.4190
F: consumption-goo	1.6613	0.1326	0.0916	1.4487	0.0521	0.0360	1.4487	1.0000	1.4991

5. The relative price level: real vs. nominal

				(a)	Inf. or def	(b)		(c)	
	r (0)	r =∂Yt/∂Kt	P_Y=r(0)/r real	$r_{M(0)\ given}$	$P_Y=r_{M(0)}/r$ rea	r_M* at β*	(a)/(b)	r_{CB} goal see	(a)/(c)
Case 1. Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0333	0.9909	0.0303	1.0899
H: capital-goods	0.03566	0.03566	1.0000	0.0330	0.9255	0.0259	1.2732	0.0236	1.4001
F: consumption-goo	0.06071	0.06071	1.0000	0.0330	0.5436	0.0374	0.8831	0.0340	0.9718
Case 2. Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0333	0.9909	0.0303	1.0899
H: capital-goods	0.05094	0.05094	1.0000	0.0330	0.6478	0.0347	0.9510	0.0336	0.9820
F: consumption-goo	0.05094	0.05094	1.0000	0.0330	0.6479	0.0327	1.0084	0.0281	1.1755
Case 3. Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0387	0.8518	0.0342	0.9654
H: capital-goods	0.04908	0.04908	1.0000	0.0330	0.6724	0.0346	0.9541	0.0290	1.1389
F: consumption-goo	0.05213	0.05213	1.0000	0.0330	0.6331	0.0348	0.9491	0.0327	1.0091

Note: If the price level of output, P_Y, is one, real=nominal and the elasticity of substitution, σ, is always 1.0.

r(real)=∂Yt/∂Kt=$\alpha A t K t^{\wedge\alpha-1} L t^{1-\alpha}$ and w(real)=∂Yt/∂Lt=$(1-\alpha) A t K t^{\alpha} L t^{-\alpha}$

6. Relationships between price levels: r_H & w_H for P_H and r_F & w_F for P_F — **Rybczynski**

For H, $P_H=a_{KH}.r_H+a_{LH}.w_H$ — When real=nominal, the price level is 1.0. — The elasticity of substitution is 1.0.

For F, $P_F=a_{KF}.r_F+a_{LF}.w_F$

		r_H	r_F	w_H	w_F	P_H	P_F	$p=P_H/P_F$
Case 1.	Total	0.05094		4.3645		1.0000		1.0000
	H: capital-goods	0.03566		3.9622		1		1
	F: consumption-goods		0.06071		4.5375		1	
Case 2.	Total	0.05094		4.3645		1.0000		1.0000
	H: capital-goods	0.05094		3.9622		1		1
	F: consumption-goods		0.05094		4.5375		1	
Case 3.	Total	0.05094		3.8628		1.0000		1.0000
	H: capital-goods	0.04908		3.5630		1		1
	F: consumption-goods		0.05213		4.0393		1	

T7 Case 3. L decreases in consumption-goods by 10% **Uzawa [1962]**

Country=capital-goods+consumption-goods: T=H+F ΔY(0)/Y(0) -0.10561 $A(0)=k(0)^{1-\alpha}/\Omega(0)$

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5002	5502	1850	1550	3.5346
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.09087	1.78398	0.05094	7.5799	4.2489	0.33622	0.6000	0.29795	0.05452	0.28170	3.8628

H: capital-goods $\Delta Y_{H(0)}/Y_{H(0)}$ 0.13013

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	479.98	3828.24	131.52	56	187.88	**1710.17**	1898.05	899.29	767.77	3.2197
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.09899	2.01694	0.04908	7.9758	3.9544	0.47379	0.7000	0.43462	0.06929	0.40450	**3.5630**

F: consumption-goods ΔL/L: -0.1 $\Delta Y_{F(0)}/Y_{F(0)}$ -0.19413

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	815.02	5987.76	168.48	143.64	312.12	**3292.13**	3604.25	950.72	782.23	3.7209
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.08660	1.66131	0.05213	7.3468	4.4223	0.26378	0.5398	0.22767	0.04675	0.21703	**4.0393**

$Y_{H(0)}/Y_{F(0)}$ 0.52661 $\mathbf{\Omega_{H(0)}>\Omega_{F(0)}}$

Using goal seek, where w_F approaches $w=w_H$

7. The neutrality of financial assets and the coeffcient *x=r/w*

ke*=Ω*^(1/(1−α)) $x_e^*/x_0=k(0)/ke^*$

	r_{CB} goal see	r_M^* at β^*	r^*/r_{M^*}	$c_{CB}=r_M^*/r_{CB}$	α_x	$x_0=\alpha_x/k(0$	ke*	$x_e^*=\alpha_x/ke^*$	x_0/x_e^*
Case 1. Total	0.0303	0.0333	1.5294	1.09992	0.0885	0.0117	1.6629	0.0532	0.2194
H: capital-goods	0.0236	0.0259	1.3757	1.09965	0.0885	0.0090	2.4517	0.0361	0.2494
F: consumption-goo	0.0340	0.0374	1.6247	1.10043	0.0885	0.0134	1.3738	0.0644	0.2078
	goal seek			**goal seek**	$\alpha_x=\alpha/(1-\alpha)$				
Case 2. Total	0.0303	0.0333	1.5294	1.09993	0.0885	0.0117	1.6629	0.0532	0.2194
H: capital-goods	0.0336	0.0347	1.3779	1.10005	0.1011	0.0112	1.9132	0.0528	0.2129
F: consumption-goo	0.0281	0.0327	1.6491	1.10027	0.0837	0.0119	1.5704	0.0533	0.2225
Case 3. Total	0.0342	0.0387	1.5146	1.10001	0.1000	0.0117	1.8902	0.0529	0.2207
H: capital-goods	0.0290	0.0346	1.5402	1.09974	0.1099	0.0111	2.1785	0.0504	0.2199
F: consumption-goo	0.0327	0.0348	1.4487	1.10018	0.0948	0.0120	1.7432	0.0544	0.2214

Note: When the effective labour is used, the coefficient, x_0 and x_e, are connected with *ke* (0) (see also below).

8. Data for the Heckshcr-Ohlin, Rybczynski, the Stolper-Samuelson, and Leontief paradox

$p=P_M/P_F=1$	k(0)	Δk/k(0)		*sigma*	w(0)=w(rea	w(0)/r(0)	r(0)/w(0)	k/(w/r)	α_x(w/r)
Case 1. Total	7.5799	(Δ(w/r)/(w/r)			4.3645	85.68	0.0117	0.0885	7.5799
H: capital-goods	9.8305	0.0000	0.0000	#DIV/0!	3.9622	111.12	0.0090	0.0885	9.8305
F: consumption-goo	6.6121	0.0000	0.0000	#DIV/0!	4.5375	74.74	0.0134	0.0885	6.6121
							=α/(1-α)=α_x		=k(0)
Case 2. Total	7.5799				4.3645	85.68	0.0117	0.0885	7.5799
H: capital-goods	7.8644	-0.2000	(0.3000)	-0.6666	3.9622	77.78	0.0129	0.1011	7.8644
F: consumption-goo	7.4576	0.1279	0.1918	-0.6666	4.5375	89.08	0.0112	0.0837	7.4576
Case 3. Total	7.5799				3.8628	75.83	0.0132	0.1000	7.5799
H: capital-goods	7.9758	-0.1887	(0.3467)	-0.5442	3.5630	72.60	0.0138	0.1099	7.9758
F: consumption-goo	7.3468	0.1111	0.0368	-3.0222	4.0393	77.49	0.0129	0.0948	7.3468

Note: When the effective labour is used, the current wage rate and the profit rate are connected with *k* (0).

Rybczenski [1955] only holds under the condition of H-O.

9. Introduction of relative price level, $p=P_H/P_F$: Duality [Jones, R. W., 1965] S-Samuelson [1941]

$r_F=r_F(0)=\partial Y_F/\partial K_F$ $r_H(0)_{nominal}=p\cdot(\partial Y_H/\partial K_H)$, where $p=P_H/P_F$ $w_F=w_F(0)=\partial Y_F/\partial L_F$ $w_{H(0)nominal}=p\cdot(\partial Y_H/\partial L_H)$

	Marginal productivity	$r_{H(marg.pro.)}$	$r_{F(margi.Pro.)}$	$w_{H(margi.Pro.)}$	$w_{F(matgi.pro.)}$	P_H	P_F	$p=P_H/P_F$	Changes (%)
Case 1.	Total	0.05094		4.3645					for r & w
	H: capital-goods	0.03566		3.9622		1		1	1.4286
	F: consumption-goods		0.06071		4.5375		1		1.3764
Case 2.	Total	0.05094		4.3645					0.8390
	H: capital-goods	**0.05094**		3.9622		1		1.0000	0.8587
	F: consumption-goods		0.05094		4.5375		1.0000		1.0000
Case 3.	Total	0.05094		3.8628					0.8992
	H: capital-goods	0.04908		3.5630		1.0000		1.0000	1.0000
	F: consumption-goods		0.05213		**4.0393**		1.0000		0.8902

T8 Case 1. Both regions have different rates of profit and the wage rates **Uzawa [1962]**

Country=capital-goods+consumption-goods: T=H+F $A(0)=k(0)^{1-\alpha}/\Omega(0)$

n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5652	6152	2500	2200	4.0295
α	Ω(0)	r(0)	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08127	1.59558	0.05094	7.5799	4.7506	0.40637	0.6000	0.37594	0.04876	0.35761	4.3645
H: capital-goods		0.39	s=S/Y	0.40637	0.273	0.273		0.429		
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	526.25	3828.24	95.55	41	136.50	1543.00	1679.50	1072.50	976.95	2.7161
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.08127	2.27940	0.03566	7.2745	3.1914	0.63858	0.7000	0.61678	0.05689	0.58169	2.9320
F: consumption-goods			1-s	0.59363						
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	768.75	5987.76	204.45	159.05	363.50	4109.00	4472.50	1427.50	1223.05	4.9239
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.08127	1.33879	0.06071	7.7890	5.8179	0.31917	0.5624	0.28656	0.04571	0.27346	5.3451
Cases correspond with Hecksher-Ohlin by region.							$Y_{H(0)}/Y_{F(0)}$	0.37552		$\Omega_{H(0)}>\Omega_{F(0)}$

1. Basic variables and parameters under convergence (*delta=alpha*)

		$g_Y{}^*=g_K{}^*$	$g_A{}^*$	$g_y{}^*$	Ω^*	r^*	i	$\beta^*{}_{(\delta=\alpha)}$	n	α
Case 1.	Total	0.1363	0.1174	0.1278	1.5956	0.0509	0.33485	0.6494	0.00755	0.08127
H: capital-goods		0.1658	0.1443	0.1571	2.2794	0.0357	0.52225	0.7237	0.00755	0.08127
F: consumption-goo		0.1206	0.1031	0.1122	1.3388	0.0607	0.26448	0.6103	0.00755	0.08127
Case 2.	Total	0.1363	0.1174	0.1278	1.5956	0.0509	0.33485	0.6494	0.00755	0.08127
H: capital-goods		0.1567	0.1344	0.1480	1.8026	0.0509	0.41686	0.6775	0.00755	0.09182
F: consumption-goo		0.1276	0.1100	0.1192	1.5166	0.0509	0.30356	0.6377	0.00755	0.07725
Case 3.	Total	0.1465	0.1241	0.1379	1.9578	0.0509	0.41087	0.6979	0.00755	0.09973
H: capital-goods		0.1772	0.1532	0.1684	1.8325	0.0491	0.47797	0.6794	0.00755	0.08994
F: consumption-goo		0.1260	0.1050	0.1176	2.0473	0.0521	0.36295	0.7107	0.00755	0.10672

2. Basic variables and parameters under the current situation (*delta>alpha*)

		$g_{Y(a)}$	$g_{K(a)}$	$g_{A(a)}$	$g_{y(a)}$	*delta*	$\beta_{actual\ (\delta>\alpha)}$	$\beta^*-\beta$	$k(0)$	$y(0)$
Case 1.	Total	0.0800	0.3000	0.0487	0.0718	0.0893	0.85223	-0.2028	7.5799	4.7506
H: capital-goods		0.0400	0.4000	0.0289	0.0322	0.0878	0.94389	-0.2202	7.2745	3.1914
F: consumption-goo		0.0489	0.0986	0.0339	0.0410	0.0904	0.86925	-0.2589	7.7890	5.8179
For min capital-goods growth			0.0509							
Case 2.	Total	0.0800	0.3000	0.0487	0.0718	0.0893	0.85223	-0.2028	7.5799	4.7506
H: capital-goods		0.0400	0.4000	-0.0036	0.0322	0.0852	1.00850	-0.3310	5.8196	3.2285
F: consumption-goo		0.0489	0.0999	0.0342	0.0410	0.0916	0.88382	-0.2461	8.7849	5.7925
Case 3.	Total	0.0800	0.3000	0.0433	0.0718	0.0804	0.89869	-0.2008	7.5799	3.8716
H: capital-goods		0.0400	0.4000	-0.0028	0.0322	0.0864	1.00591	-0.3265	6.3473	3.4637
F: consumption-goo		0.0473	0.0782	0.0322	0.0395	0.0701	0.91797	-0.2073	8.6544	4.2272

$g_{A(a)}=g_{Y(a)}-\alpha g_{K(a)}-(1-\alpha)n$ delta=(n+α(i-iβ*-n))/(i(1-β*)) $\beta_{actual(\delta>\alpha)}=1-((1/i)(g_{A(a)}k(0)\hat{}(\delta-\alpha))$

3. Relationships between quantities: K_H & K_F and L_H & L_F

							Heckscher-Ohlin		
For K,	$a_{KH}=\Omega_H$ $a_{KF}=\Omega_F$			y_H	$a_{LH}=1/y_H$	$K=(a_{KH}\cdot y_H)L_H+(a_{KF}\cdot y_F)L_F$		$K=a_{KH}\cdot Y_H+a_{KF}\cdot Y_F$	
						$L=(a_{LH}\cdot y_H)L_H+(a_{LF}\cdot y_F)L_F$		$L=a_{LH}\cdot Y_H+a_{LF}\cdot Y_F$	
For L,	$a_{LH}=1/y_H$ $a_{LF}=1/y_F$	$a_{KH}=\Omega_H$	$a_{KF}=\Omega_F$	y_F	$a_{LF}=1/y_F$	L_H &L_F	Y_H &Y_F	$K=K_H+K_F$	$L=L_H+L_F$
Case 1.	Total	1.5956		4.7506	0.21050	1295	6152	9816	1295
	H: capital-goods	2.2794		3.1914	**0.31334**	526.25	1679.50	3828	526
	F: consumption-goods		1.3388	5.8179	**0.17188**	768.75	4472.50	5988	769
Case 2.	Total	1.5956		4.7506	0.21050	1295	6152	9816	1295
	H: capital-goods	1.8026		3.2285	**0.30974**	526.25	1699.00	3063	526
	F: consumption-goods		1.5166	5.7925	**0.17264**	768.75	4453.00	6753	769
Case 3.	Total	1.9578		3.8716	0.25829	1295	5014	9816	1295
	H: capital-goods	1.8325		3.4637	**0.28871**	603.13	2089.05	3828	603
	F: consumption-goods		2.0473	4.2272	**0.23656**	691.87	2924.67	5988	692

T8 Case 2. K decreases in capital-goods by 20% **Uzawa [1962]: $\Omega_H > \Omega_F$**

Country=capital-goods+consumption-goods: T=H+F							$\Delta Y(0)/Y(0)$	0.00000	$A(0)=k(0)^{1-\alpha}/\Omega(0)$	
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5652	6152	2500	2200	4.0295
α	$\Omega(0)$	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08127	1.59558	0.05094	7.5799	4.7506	0.40637	0.6000	0.37594	0.04876	0.35761	4.3645
H: capital-goods			$\Delta K/K$:	-0.2			$\Delta Y_{H(0)}/Y_{H(0)}$	0.01162		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	526.25	3062.59	109.21	47	**156.01**	1543.00	1699.00	858.00	748.79	2.7464
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.09182	1.80258	**0.05094**	5.8196	3.2285	0.50500	0.7000	0.47100	0.06428	0.44073	2.9320
F: consumption-goods	Using goal seek, where r_H approaches $r=r_F$						$\Delta Y_{F(0)}/Y_{F(0)}$	-0.00436		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	768.75	6753.41	190.79	153.20	343.99	4109.00	4453.00	1642.00	1451.21	4.8974
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.07725	1.51660	0.05094	8.7849	5.7925	0.36874	0.5546	0.34048	0.04285	0.32589	5.3451
							$Y_{H(0)}/Y_{F(0)}$	0.38154		

4. The Penrose curve, B_K, and the assets valuation ratio, v

		Ω^*	I/K	$g_K{}^*$	Slope B_K	r^*	r_{M^*}	Slope A	Slope B_K/A	$v=1/\beta^*$
Case 1.	Total	1.5956	0.2099	0.1363	1.5398	0.0509	0.0331	1.5398	1.0000	1.5398
H: capital-goods		2.2794	0.2291	0.1658	1.3818	0.0357	0.0258	1.3818	1.0000	1.3818
F: consumption-goo		1.3388	0.1976	0.1206	1.6385	0.0607	0.0371	1.6385	1.0000	1.6385
Case 2.	Total	1.5956	0.2099	0.1363	1.5398	0.0509	0.0331	1.5398	1.0000	1.5398
H: capital-goods		1.8026	0.2313	0.1676	1.3794	0.0509	0.0369	1.3794	1.0000	1.4760
F: consumption-goo		1.5166	0.2002	0.1201	1.6669	0.0509	0.0306	1.6669	1.0000	1.5682
Case 3.	Total	1.9578	0.2099	0.1389	1.5106	0.0625	0.0414	1.5106	1.0000	1.4329
H: capital-goods		1.8325	0.2608	0.1673	1.5589	0.0491	0.0315	1.5589	1.0000	1.4719
F: consumption-goo		2.0473	0.1773	0.1238	1.4321	0.0521	0.0364	1.4321	1.0000	1.4071

5. The relative price level: real vs. nominal

					(a)	Inf. or def	(b)		(c)	
		$r(0)$	$r=\partial Yt/\partial Kt$	$P_Y=r(0)/r_{real}$	$r_{M(0)\ given}$	$p_Y=r_{M(0)}/r_{rea}$	$r_M{}^*$ at β^*	(a)/(b)	r_{CB} goal see	(a)/(c)
Case 1.	Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0331	0.9976	0.0301	1.0972
H: capital-goods		0.03566	0.03566	1.0000	0.0330	0.9255	0.0258	1.2789	0.0235	1.4063
F: consumption-goo		0.06071	0.06071	1.0000	0.0330	0.5436	0.0371	0.8907	0.0337	0.9801
Case 2.	Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0331	0.9976	0.0301	1.0972
H: capital-goods		0.05094	0.05094	1.0000	0.0330	0.6478	0.0345	0.9562	0.0336	0.9831
F: consumption-goo		0.05094	0.05094	1.0000	0.0330	0.6479	0.0325	1.0160	0.0278	1.1879
Case 3.	Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0436	0.7565	0.0376	0.8774
H: capital-goods		0.04908	0.04908	1.0000	0.0330	0.6724	0.0333	0.9897	0.0286	1.1527
F: consumption-goo		0.05213	0.05213	1.0000	0.0330	0.6331	0.0370	0.8908	0.0331	0.9976

Note: If the price level of output, P_Y, is one, real=nominal and the elasticity of substitution, σ, is always 1.0.

$r(real)=\partial Yt/\partial Kt=\alpha AtKt^{\alpha-1}Lt^{1-\alpha}$ and $w(real)=\partial Yt/\partial Lt=(1-\alpha)AtKt^{\alpha}Lt^{-\alpha}$

6. Relationships between price levels: r_H & w_H for P_H and r_F & w_F for P_F **Rybczynski**

For H, $P_H=a_{KH}.r_H+a_{LH}.w_H$ When real=nominal, the price level is 1.0. The elasticity of substitution is 1.0.

For F, $P_F=a_{KF}.r_F+a_{LF}.w_F$

		r_H	r_F	w_H	w_F	P_H	P_F	$p=P_H/P_F$
Case 1.	Total	0.05094		4.3645		1.0000		1.0000
	H: capital-goods	0.03566		2.9320		1		1
	F: consumption-goods		0.06071		5.3451		1	
Case 2.	Total	0.05094		4.3645		1.0000		1.0000
	H: capital-goods	0.05094		2.9320		1		1
	F: consumption-goods		0.05094		5.3451		1	
Case 3.	Total	0.05094		3.4855		1.0000		1.0000
	H: capital-goods	0.04908		3.1522		1		1
	F: consumption-goods		0.05213		3.7761		1	

T8 Case 3. L decreases in consumption-goods by 10% **Findlay [1960]**

Country=capital-goods+consumption-goods: T=H+F $\Delta Y(0)/Y(0)$ -0.18503 $A(0)=k(0)^{1-\alpha}/\Omega(0)$

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	4514	5014	2500	2200	3.1635
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.09973	1.95783	0.05094	7.5799	3.8716	0.49863	0.6000	0.46672	0.05984	0.43880	3.4855

H: capital-goods $\Delta Y_{H(0)}/Y_{H(0)}$ 0.24385

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	603.13	3828.24	131.52	56	187.88	**1901.17**	2089.05	1215.25	1083.73	2.9333
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.08994	1.83253	0.04908	6.3473	3.4637	0.58172	0.7000	0.55362	0.06295	0.51877	**3.1522**

F: consumption-goods ΔL/L: -0.1 $\Delta Y_{F(0)}/Y_{F(0)}$ -0.34608

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	691.87	5987.76	168.48	143.64	312.12	**2612.55**	2924.67	1284.75	1116.27	3.3576
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.10672	2.04733	0.05213	8.6544	4.2272	0.43928	0.5398	0.40500	0.05761	0.38167	**3.7761**

$Y_{H(0)}/Y_{F(0)}$ 0.71429 $\mathbf{\Omega_{H(0)}<\Omega_{F(0)}}$

7. The neutrality of financial assets and the coeffcient *x=r/w*

$ke^*=\Omega^*\wedge(1/(1-\alpha))$ $x_e^*/x_0=k(0)/ke^*$

	r_{CB} goal see	r_M* at β*	r^*/r_{M^*}	$c_{CB}=r_M^*/r_{CB}$	α_x	$x_0=\alpha_x/k(0$	ke*	$x_e^*=\alpha_x/ke^*$	x_0/x_e^*
Case 1. Total	0.0301	0.0331	1.5398	1.09987	0.0885	0.0117	1.6629	0.0532	0.2194
H: capital-goods	0.0235	0.0258	1.3818	1.09959	0.0885	0.0122	2.4517	0.0361	0.3370
F: consumption-goo	0.0337	0.0371	1.6385	1.10039	0.0885	0.0114	1.3738	0.0644	0.1764
	goal seek			**goal seek**	$\alpha_x=\alpha/(1-\alpha)$				
Case 2. Total	0.0301	0.0331	1.5398	1.09988	0.0885	0.0117	1.6629	0.0532	0.2194
H: capital-goods	0.0336	0.0345	1.3794	1.10007	0.1011	0.0152	1.9132	0.0528	0.2876
F: consumption-goo	0.0278	0.0325	1.6669	1.09999	0.0837	0.0101	1.5704	0.0533	0.1889
Case 3. Total	0.0376	0.0436	1.5106	1.10004	0.1108	0.0117	2.1091	0.0525	0.2222
H: capital-goods	0.0286	0.0333	1.5589	1.09969	0.0988	0.0139	1.9456	0.0508	0.2744
F: consumption-goo	0.0331	0.0370	1.4321	1.10040	0.1195	0.0102	2.2303	0.0536	0.1908

Note: When the effective labour is used, the coefficient, x_0 and x_e, are connected with *ke* (0) (see also below).

8. Data for the Hecksher-Ohlin, Rybczynski, the Stolper-Samuelson, and Leontief paradox

$p=P_M/P_F=1$	k(0)	Δk/k(0)		*sigma*	w(0)=w(re	w(0)/r(0)	r(0)/w(0)	k/(w/r)	α_x(w/r)
Case 1. Total	7.5799		(Δ(w/r)/(w/r)		4.3645	85.68	0.0117	0.0885	7.5799
H: capital-goods	7.2745	0.0000	0.0000	#DIV/0!	2.9320	82.23	0.0122	0.0885	7.2745
F: consumption-goo	7.7890	0.0000	0.0000	#DIV/0!	5.3451	88.05	0.0114	0.0885	7.7890
								=α/(1-α)=α_x	=k(0)
Case 2. Total	7.5799				4.3645	85.68	0.0117	0.0885	7.5799
H: capital-goods	5.8196	-0.2000	(0.3000)	-0.6666	2.9320	57.56	0.0174	0.1011	5.8196
F: consumption-goo	8.7849	0.1279	0.1918	-0.6666	5.3451	104.94	0.0095	0.0837	8.7849
Case 3. Total	7.5799				3.4855	68.43	0.0146	0.1108	7.5799
H: capital-goods	6.3473	-0.1275	(0.2189)	-0.5822	3.1522	64.23	0.0156	0.0988	6.3473
F: consumption-goo	8.6544	0.1111	(0.1772)	0.6269	3.7761	72.44	0.0138	0.1195	8.6544

Note: When the effective labour is used, the current wage rate and the profit rate are connected with *k* (0).

Rybczenski [1955] only holds under the condition of H-O.

9. Introduction of relative price level, $p=P_H/P_F$: Duality [Jones, R. W., 1965] **S-Samuelson [1941]**

$r_F=r_F(0)=\partial Y_F/\partial K_F$ $r_H(0)_{nominal}=p\cdot(\partial Y_H/\partial K_H)$, where $p=P_H/P_F$ $w_F=w_F(0)=\partial Y_F/\partial L_F$ $w_{H(0)nominal}=p\cdot(\partial Y_H/\partial L_H)$

	Marginal productivity	$r_{H(marg.pro.)}$	$r_{F(margi.Pro.)}$	$w_{H(margi.Pro.}$	$w_{F(matgi.pro.)}$	P_H	P_F	$p=P_H/P_F$	Changes (%)
Case 1.	Total	0.05094		4.3645					for r & w
	H: capital-goods	0.03566		2.9320		1		1	1.4286
	F: consumption-goods		0.06071		5.3451		1		1.3764
Case 2.	Total	0.05094		4.3645					0.8390
	H: capital-goods	**0.05094**		2.9320		1		1.0000	0.8587
	F: consumption-goods		0.05094		5.3451		1.0000		1.0000
Case 3.	Total	0.05094		3.4855					1.0751
	H: capital-goods	0.04908		3.1522		1.0000		1.0000	1.0000
	F: consumption-goods		0.05213		**3.7761**		1.0000		0.7065

T9 Case 1. Both countries have the same rate of profit and the wage rate — Uzawa [1962]: $\Omega_H > \Omega_F$

World=capital-ample country+labour-ample country: W=H+F — 5987.82 — $A(0)=k(0)^{1-\alpha}/\Omega(0)$

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1294.90	9816.33	201.20	134.13	335.33	5652.49	5987.82	1252.96	1051.76	4.1283
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.05600	1.63938	0.03416	7.5808	4.6242	**0.20925**	0.6000	0.18176	0.03360	0.17565	4.3652
H: capital-ample country			K: 0.7	L W: 0.3						
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	388.47	5500.00	112.73	75.15	187.88	1695.75	1883.63	700.00	587.27	3.7225
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.09974	2.91990	0.03416	14.1581	4.8488	0.37162	0.6000	0.33162	0.05985	0.31178	4.3652
F: laour-ample country			K: 0.3	L W: 0.7						
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	906.43	4316.33	88.47	58.98	147.45	3956.74	4104.20	552.96	464.49	4.2810
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.03593	1.05169	0.03416	4.7619	4.5279	0.13473	0.6000	0.11567	0.02156	0.11317	4.3652

Cases correspond with Hecksher-Ohlin by region. — $Y_{H(0)}/Y_{F(0)}$ 0.45895

1. Basic variables and parameters under convergence (*delta=alpha*)

		$g_Y{}^*=g_K{}^*$	$g_A{}^*$	$g_y{}^*$	Ω^*	r^*	i	$\beta^*{}_{(\delta=\alpha)}$	n	α
Case 1.	World	0.0703	0.0588	0.0623	1.6394	0.0342	0.17412	0.6622	0.00755	0.05600
H: capital-ample country		0.0829	0.0673	0.0748	2.9199	0.0342	0.30927	0.7824	0.00755	0.09974
F: labour-ample country		0.0594	0.0496	0.0515	1.0517	0.0342	0.11210	0.5573	0.00755	0.03593
Case 2.	World	0.0773	0.0588	0.0692	1.6394	0.0919	0.18548	0.6831	0.00755	0.15068
H: capital-ample country		0.0919	0.0612	0.0837	2.9199	0.0919	0.32950	0.8142	0.00755	0.26838
F: labour-ample country		0.0648	0.0513	0.0568	1.0517	0.0919	0.11938	0.5704	0.00755	0.09666
Case 3.	World	0.0703	0.0588	0.0623	1.6394	0.0342	0.17413	0.6622	0.00755	0.05608
H: capital-ample country		0.0829	0.0673	0.0748	2.9199	0.0342	0.30928	0.7824	0.00755	0.09988
F: labour-ample country		0.0594	0.0496	0.0515	1.0517	0.0342	0.11210	0.5574	0.00755	0.03598

2. Basic variables and parameters under the current situation (*delta>alpha*)

		$g_{Y(a)}$	$g_{K(a)}$	$g_{A(a)}$	$g_{y(a)}$	delta	$\beta_{actual\ (\delta>\alpha)}$	$\beta^*-\beta$	$k(0)$	$y(0)$
Case 1.	World	0.0800	0.3000	0.0561	0.0718	0.1310	0.62513	0.0370	7.5808	4.6242
H: capital-ample country		0.0400	0.4000	0.0298	0.0322	0.0641	0.91234	-0.1300	14.1581	4.8488
F: labour-ample country		0.0468	0.1708	0.0334	0.0389	0.1620	0.63750	-0.0802	4.7619	4.5279
For min capital-goods growth			0.0342							
Case 2.	World	0.0800	0.3000	0.0284	0.0718	-0.1072	0.90922	-0.2262	7.5808	4.6242
H: capital-ample country		0.0400	0.4000	-0.0729	0.0322	-0.7846	1.01357	-0.1994	14.1581	4.8488
F: labour-ample country		0.0468	0.0697	0.0332	0.0389	0.0616	0.73640	-0.1660	4.7619	4.5279
Case 3.	World	0.0800	0.3000	0.0561	0.0718	0.1309	0.62541	0.0368	7.5808	4.6242
H: capital-ample country		0.0400	0.4000	-0.0067	0.0322	0.0638	1.01982	-0.2374	14.1581	4.8488
F: labour-ample country		0.0468	0.1708	0.0334	0.0389	0.1620	0.63764	-0.0803	4.7619	4.5279

$g_{A(a)}=g_{Y(a)}-\alpha g_{K(a)}-(1-\alpha)n$ $\quad$ $delta=(n+\alpha(i-i\beta^*-n))/(i(1-\beta^*))$ $\quad$ $\beta_{actual(\delta>\alpha)}=1-((1/i)(g_{A(a)}k(0)^\wedge(\delta-\alpha))$

3. Relationships between quantities: K_H & K_F and L_H & L_F

Stolper-Samuelson

$K=(a_{KH}\cdot y_H)L_H+(a_{KF}\cdot y_F)L_F$ $\quad$ $K=a_{KH}\cdot Y_H+a_{KF}\cdot Y_F$

$L=(a_{LH}\cdot y_H)L_H+(a_{LF}\cdot y_F)L_F$ $\quad$ $L=a_{LH}\cdot Y_H+a_{LF}\cdot Y_F$

For K, $a_{KH}=\Omega_H$ $\quad$ $a_{KF}=\Omega_F$

For L, $a_{LH}=1/y_H$ $\quad$ $a_{LF}=1/y_F$

		$a_{KH}=\Omega_H$	$a_{KF}=\Omega_F$	y_H / y_F	$a_{LH}=1/y_H$ / $a_{LF}=1/y_F$	L_H & L_F	Y_H & Y_F	$K=K_H+K_F$	$L=L_H+L_F$
Case 1.	World	1.6394		4.6242	0.21626	1295	5988	9816.33	1294.90
	H: capital-ample country	2.9199		4.8488	**0.20624**	388.47	1883.63	5500	388
	F: labour-ample country		1.0517	4.5279	**0.22085**	906.43	4104.20	4316	906
Case 2.	World	1.6394		4.6242	0.21626	1295	5988	9816	1295
	H: capital-ample country	2.9199		4.8488	**0.20624**	388.47	1883.63	5500	388
	F: labour-ample country		1.0517	4.5279	**0.22085**	906.43	4104.20	4316	906
Case 3.	World	1.6394		4.6242	0.21626	1295	5988	9816	1295
	H: capital-ample country	2.9199		4.8488	**0.20624**	388.47	1883.63	5500	388
	F: labour-ample country		1.0517	4.5279	**0.22085**	906.43	4104.20	4316	906

T9 Case 2. Using r and w with the price level **Here, start from the price level** **p>1** **Uzawa [1962]**

World=capital-ample country+labour-ample country: W					5988.00		$\Delta Y(0)/Y(0)$	0.00000	$A(0)=k(0)^{1-\alpha}/\Omega(0)$	
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1294.90	9816.33	541.35	360.90	902.25	5085.75	5987.82	1252.96	711.61	3.4078
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.15068	1.63938	0.09191	7.5808	4.6242	**0.20925**	0.6000	0.13066	0.09041	0.11884	3.9275
H: capital-ample country							$\Delta Y_{H(0)}/Y_{H(0)}$	0.00000		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	388.47	5500.00	303.31	202.21	505.52	1525.73	1883.63	700.00	396.69	2.3809
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.26838	2.91990	0.09191	14.1581	4.8488	0.37162	0.6000	0.25102	0.16103	0.21060	3.9275
F: laour-ample cou	Using goal seek, where r_M approaches $r=r_F$						$\Delta Y_{F(0)}/Y_{F(0)}$	0.00000		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	906.43	4316.33	238.04	158.69	396.73	3560.03	4104.20	552.96	314.92	3.8938
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.09666	1.05169	0.09191	4.7619	4.5279	0.13473	0.6000	0.08146	0.05800	0.07673	3.9275
For cases 2 and 3, $Y_H(0)$ and $Y_F(0)$ must be given (without using each							$Y_{H(0)}/Y_{F(0)}$	0.45895		$\Omega_{H(0)}>\Omega_{F(0)}$

4. The Penrose curve, B_K, and the assets valuation ratio, v

		Ω^*	I/K	$g_K{}^*$	Slope B_K	r^*	r_{M^*}	Slope A	Slope B_K/A	$v=1/\beta^*$
Case 1.	World	1.6394	0.1062	0.0703	1.5102	0.0342	0.0226	1.5102	1.0000	1.5102
H: capital-ample country		2.9199	0.1059	0.0829	1.2781	0.0342	0.0267	1.2781	1.0000	1.2781
F: labour-ample country		1.0517	0.1066	0.0594	1.7942	0.0342	0.0190	1.7942	1.0000	1.7942
Case 2.	World	1.6394	0.1131	0.0773	1.4631	0.0919	0.0628	1.4631	1.0000	1.4640
H: capital-ample country		2.9199	0.1128	0.1002	1.1259	0.0919	0.0816	1.1259	1.0000	1.2283
F: labour-ample country		1.0517	0.1135	0.0629	1.8050	0.0919	0.0509	1.8050	1.0000	1.7531
Case 3.	World	1.6394	0.1062	0.0703	1.5102	0.0342	0.0227	1.5102	1.0000	1.5101
H: capital-ample country		2.9199	0.1059	0.0829	1.2780	0.0342	0.0268	1.2780	1.0000	1.2781
F: labour-ample country		1.0517	0.1066	0.0594	1.7942	0.0342	0.0191	1.7942	1.0000	1.7942

5. The relative price level: real vs. nominal

					(a)	Inf or def	(b)		(c)	
		$r(0)$	r=∂Yt/∂Kt	$P_Y=r(0)/r_{real}$	$r_{M(0)\ given}$	$p_Y=r_{M(0)}/r_{real}$	$r_M{}^*$ at β^*	(a)/(b)	$r_{CB\ given}$	(a)/(c)
Case 1.	World	0.03416	0.03416	1.0000	0.0330	0.9660	0.0226	1.4589	0.027	1.2222
H: capital-ample country		0.03416	0.03416	1.0000	0.0330	0.9660	0.0267	1.2347	0.027	1.2222
F: labour-ample country		0.03416	0.03416	1.0000	0.0330	0.9660	0.0190	1.7332	0.027	1.2222
Case 2.	World	0.09191	0.09191	1.0000	0.0325	0.3536	0.0628	0.5177	0.027	1.2037
H: capital-ample country		0.09191	0.09191	1.0000	0.0300	0.3264	0.0748	0.4009	0.027	1.1111
F: labour-ample country		0.09191	0.09191	1.0000	0.0330	0.3590	0.0524	0.6294	0.027	1.2222
Case 3.	World	0.03421	0.03421	1.0000	0.0310	0.9062	0.0227	1.3685	0.027	1.1481
H: capital-ample country		0.03421	0.03421	1.0000	0.0330	0.9647	0.0268	1.2330	0.027	1.2222
F: labour-ample country		0.03421	0.03421	1.0000	0.0300	0.8770	0.0191	1.5735	0.027	1.1111

Note: If the price level of output, P_Y, is one, real=nominal and the elasticity of substitution, σ, is always 1.0.

$r(real)=\partial Yt/\partial Kt=\alpha AtKt^{\alpha-1}Lt^{1-\alpha}$ and $w(real)=\partial Yt/\partial Lt=(1-\alpha)AtKt^{\alpha}Lt^{-\alpha}$

6. Relationships between price levels: r_H & w_H for P_H and r_F & w_F for P_F **Stolper-Samuelson**

For H,	$P_H=a_{KH}.r_H+a_{LH}.w_H$	When real=nominal, the price level is 1.0.				The elasticity of substitution is 1.0.			
For F,	$P_F=a_{KF}.r_F+a_{LF}.w_F$	r_H	r_F	w_H	w_F	P_H	P_F	$p=P_H/P_F$	
Case 1.	World	0.03416		4.3652		1.0000		1.0000	For p,
	H: capital-ample country	0.03416		4.3652		1		1	using goal
	F: labour-ample country		0.03416		4.3652		1		seek
Case 2.	World	0.09191		3.9275		1.0000		1.0000	Y(0)
	H: capital-ample country	0.09191		3.9275		**1.17811**		1.17811	5988
	F: labour-ample country		0.09191		3.9275		**1**		5988
Case 3.	World	0.03421		4.3650		1.0000		1.0000	Y(0)
	H: capital-ample country	0.03421		4.3650		**1.00009**		1.00009	5988
	F: labour-ample country		0.03421		4.3650		**1**		5988

T9 Case 3. Using r and w with the price level **Here, start from the price level** **Uzawa [1962]**

World=capital-ample country+labour-ample country: W						5988.00	$\Delta Y(0)/Y(0)$	0.00000		$A(0)=k(0)^{1-\alpha}/\Omega(0)$
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	$\Pi(0)$	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1294.90	9816.33	201.48	134.32	335.79	5652.21	5987.82	1252.96	1051	4.1276
α	$\Omega(0)$	r(0)	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.05608	1.63938	0.03421	7.5808	4.6242	**0.20925**	0.6000	0.18172	0.03365	0.17560	4.3650
H: capital-ample country							$\Delta Y_{H(0)}/Y_{H(0)}$	0.00000		
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	$\Pi(0)$	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	388.47	5500.00	112.89	75.26	188.14	1695.66	1883.63	700.00	587.11	3.7211
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.09988	2.91990	0.03421	14.1581	4.8488	0.37162	0.6000	0.33156	0.05993	0.31169	4.3650
F: laour-ample country							$\Delta Y_{F(0)}/Y_{F(0)}$	0.00000		
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	$\Pi(0)$	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	906.43	4316.33	88.59	59.06	147.65	3956.54	4104.20	552.96	464.37	4.2807
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.03598	1.05169	0.03421	4.7619	4.5279	0.13473	0.6000	0.11564	0.02159	0.11314	4.3650
S-S proposes that if the price of H goods rises then the price of F go							$Y_{H(0)}/Y_{F(0)}$	0.45895		$\Omega_{H(0)}>\Omega_{F(0)}$

7. The neutrality of financial assets and the coeffcient *x=r/w*

$ke^*=\Omega^*$^(1/(1−α)) $x_e^*/x_0=k(0)/ke^*$

		r_{CB} given	r_M^* at β^*	r^*/r_{M^*}	$c_{CB}=r_M^*/r_{CB}$	α_x	$x_0=\alpha_x/k(0$	ke*	$x_e^*=\alpha_x/ke^*$	x_0/x_e^*
Case 1.	World	0.027	0.0226	1.5102	0.83779	0.0593	0.0078	1.6882	0.0351	0.2227
	H: capital-ample country	0.027	0.0267	1.2781	0.98987	0.1108	0.0078	3.2880	0.0337	0.2322
	F: labour-ample country	0.027	0.0190	1.7942	0.70518	0.0373	0.0078	1.0537	0.0354	0.2213
						$\alpha_x=\alpha/(1-\alpha)$				
Case 2.	World	0.027	0.0628	1.4631	2.32665	0.1774	0.0234	1.7896	0.0991	0.2361
	H: capital-ample country	0.027	0.0748	1.1259	3.02353	0.3668	0.0078	4.3259	0.0848	0.0923
	F: labour-ample country	0.027	0.0524	1.8050	1.88602	0.1070	0.0078	1.0574	0.1012	0.0773
Case 3.	World	0.027	0.0227	1.5102	0.83896	0.0594	0.0078	1.6882	0.0352	0.2224
	H: capital-ample country	0.027	0.0268	1.2780	0.99133	0.1110	0.0078	3.2886	0.0337	0.2319
	F: labour-ample country	0.027	0.0191	1.7942	0.70612	0.0373	0.0078	1.0537	0.0354	0.2210

Note: When the effective labour is used, the coefficient, x_0 and x_e, are connected with ke(0) (see also below).

8. Data for the Heckscher-Ohlin, Rybczynski, the Stolper-Samuelson, and Leontief paradox

$p=P_M/P_F=1$		k(0)	Δk/k(0)		sigma	w(0)=w(re	w(0)/r(0)	r(0)/w(0)	k/(w/r)	α_x(w/r)
Case 1.	World	7.5808		(Δ(w/r)/(w/r)		4.3652	127.78	0.0078	0.0593	7.5808
	H: capital-ample country	14.1581	0.0000	0.0000	#DIV/0!	4.3652	127.79	0.0078	0.1108	14.1581
	F: labour-ample country	4.7619	0.0000	0.0000	#DIV/0!	4.3652	127.78	0.0078	0.0373	4.7619
									=α/(1-α)=α_x	=k(0)
Case 2.	World	7.5808				3.9275	42.73	0.0234	0.1774	7.5810
	H: capital-ample country	14.1581	0.0000	(0.6656)	0.0000	3.9275	42.73	0.0234	0.3313	15.6747
	F: labour-ample country	4.7619	0.0000	(0.6656)	0.0000	3.9275	42.73	0.0234	0.1114	4.5725
Case 3.	World	7.5808				4.3650	127.60	0.0078	0.0594	7.5810
	H: capital-ample country	14.1581	0.0000	(0.0014)	0.0000	4.3650	127.60	0.0078	0.1110	14.1596
	F: labour-ample country	4.7619	0.0000	(0.0014)	-0.0006	4.3650	127.60	0.0078	0.0373	4.7619

Note: When the effective labour is used, the current wage rate and the profit rate are connected with *k*(0).

$r=(y_F P_F-y_H P_H)/(\Omega_F y_F-\Omega_H y_H)$ $w=(y_F y_H(\Omega_H P_F-\Omega_F P_H))/(\Omega_H y_H-\Omega_F y_F)$

9. Introduction of relative price level, $p=P_H/P_F$: Duality [Jones, R. W., 1965] S-Samuelson [1941]

$r_F=r_F(0)=\partial Y_F/\partial K_F$ $r_H(0)_{nominal}=p\cdot(\partial Y_H/\partial K_H)$, where $p=P_H/P_F$ $w_F=w_F(0)=\partial Y_F/\partial L_F$ $w_{H(0)nominal}=p\cdot(\partial Y_H/\partial L_H)$

	Marginal productivity	$r_{H(marg.pro.)}$	$r_{F(margi.Pro.)}$	$w_{H(margi.Pro.}$	$w_{F(matgi.pro.)}$	P_H	P_F	$p=P_H/P_F$	Changes (%)
Case 1.	Total	0.03416		4.3652		1.0000		1.0000	for r & w
	H: capital-goods	0.03416		4.3652		1		1	2.4951
	F: consumption-goods		0.03416		4.3652		1		1.0013
Case 2.	Total	0.09191		3.9274		1.0000		1.0000	2.6905
	H: capital-goods	**0.08523**		3.6421		1.0784		1.0784	1.0013
	F: consumption-goods		0.09191		3.9275		1		0.8343
Case 3.	Total	0.03421		4.3648		1.0000		1.0000	0.9999
	H: capital-goods	0.03420		4.3646		1.0001		1.0001	0.8997
	F: consumption-goods		0.03421		**4.3650**		1		0.9999

T10 Case 1. Both countries have different rates of profit and the wage rates

									5988	p=1
World=S+C			BOP	0	Budget	-50	S-I	50	i/s	0.9167
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	ΔK=I	A(0)
0.00755	600	13500	190	145	335	5652	5988	600	550	8.3829
α	Ω(0)	r(0)	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	i=ΔK/Y	w(0)
0.05600	2.25458	0.02484	22.5000	9.9797	0.10020	0.5681	0.09487	0.03181	0.09185	9.4208
S: saving-oriented country			BOP	160	Budget	50	S-I	110	i/s	0.7250
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	ΔK=I	A(0)
0.00755	200.00	5500.00	131.52	56	187.88	1695.75	1883.63	400.00	290	6.7671
α	$\Omega_H(0)$	r(0)	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	i=ΔK/Y	w(0)
0.09974	2.91990	0.03416	27.5000	9.4181	0.21236	0.7000	0.16551	0.06982	0.15396	8.4787
C: consumption-oriented co			BOP	-160	Budget	-100	S-I	-60	i/s	1.3000
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	ΔK=I	A(0)
0.00755	400.00	8000.00	58.98	88.47	147.45	3956.74	4104.20	200.00	260	9.2135
α	$\Omega_F(0)$	r(0)	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	i=ΔK/Y	w(0)
0.03593	1.94922	0.01843	20.0000	10.2605	0.04873	0.4000	0.06427	0.01437	0.06335	9.8919
Balance of payment=household saving+government deficit							$Y_{H(0)}/Y_{F(0)}$	0.45895	**Uzawa [1962]:$\Omega_H>\Omega_F$**	

経常収支赤字＝国民の貯蓄不足＋政府の財政赤字

1. Basic variables and parameters under convergence (*delta=alpha*)

	$g_Y^*=g_K^*$	g_A^*	g_y^*	Ω^*	r^*	i	$\beta^*_{(\delta=\alpha)}$	n	α
Case 1. World	0.0310	0.0220	0.0233	2.2546	0.0248	0.09185	0.7608	0.00755	0.05600
H: capital-ample country	0.0421	0.0309	0.0343	2.9199	0.0342	0.15396	0.7992	0.00755	0.09974
F: labour-ample country	0.0243	0.0160	0.0166	1.9492	0.0184	0.06335	0.7472	0.00755	0.03593
						adjusting i by using $\theta_{1=1.0}$:			
Case 2. World	0.0205	0.0122	0.0129	2.2546	0.0248	0.05845	0.7919	0.00755	0.05600
H: capital-ample country	0.0143	0.0060	0.0067	2.9199	0.0342	0.04778	0.8738	0.00755	0.09974
F: labour-ample country	0.0243	0.0160	0.0166	1.9492	0.0184	0.06335	0.7472	0.00755	0.03593
						adjusting i by using $\theta_{1=1.0}$:			
Case 3. World	0.0221	0.0136	0.0144	2.2546	0.0248	0.06346	0.7851	0.00755	0.05600
H: capital-ample country	0.0282	0.0185	0.0205	2.9199	0.0342	0.10087	0.8169	0.00755	0.09974
F: labour-ample country	0.0184	0.0104	0.0108	1.9492	0.0184	0.04629	0.7754	0.00755	0.03593

2. Basic variables and parameters under the current situation (*delta>alpha*)

	$g_{Y(a)}$	$g_{K(a)}$	$g_{A(a)}$	$g_{y(a)}$	delta	$\beta_{actual\ (\delta>\alpha)}$	$\beta^*-\beta$	k(0)	y(0)
Case 1. World	0.0800	0.3000	0.0561	0.0718	0.2568	-0.14069	0.9015	22.5000	9.9797
H: capital-ample country	0.0400	0.4000	0.0307	0.0322	0.0221	0.84572	-0.0465	27.5000	9.4181
F: labour-ample country	0.0482	0.4374	0.0252	0.0404	0.4266	-0.28388	1.0311	20.0000	10.2605
For min capital-goods growth		0.0248							
Case 2. World	0.0800	0.3000	0.0561	0.0718	0.4186	-1.96699	2.7589	22.5000	9.9797
H: capital-ample country	0.0400	0.4000	-0.0067	0.0322	-0.2984	1.03744	-0.1637	27.5000	9.4181
F: labour-ample country	0.0482	0.4374	0.0252	0.0404	0.4266	-0.28388	1.0311	20.0000	10.2605
Case 3. World	0.0800	0.3000	0.0561	0.0718	0.3795	-1.41939	2.2045	22.5000	9.9797
H: capital-ample country	0.0400	0.4000	-0.0067	0.0322	-0.0303	1.04312	-0.2262	27.5000	9.4181
F: labour-ample country	0.0482	0.6500	0.0176	0.0404	0.6376	-1.30505	2.0804	20.0000	10.2605

$g_{A(a)}=g_{Y(a)}-\alpha g_{K(a)}-(1-\alpha)n$ delta=(n+α(i-iβ*-n))/(i(1-β*)) $\beta_{actual(\delta>\alpha)}=1-((1/i)(g_{A(a)}k(0)^\wedge(\delta-\alpha))$

3. Relationships between quantities: K_H & K_F and L_H & L_F

$K=(a_{KH}\cdot y_H)L_H+(a_{KF}\cdot y_F)L_F$ $L=(a_{LH}\cdot y_H)L_H+(a_{LF}\cdot y_F)L_F$

$K=a_{KH}\cdot Y_H+a_{KF}\cdot Y_F$ $L=a_{LH}\cdot Y_H+a_{LF}\cdot Y_F$

For K, $a_{KH}=\Omega_H$ $a_{KF}=\Omega_F$

For L, $a_{LH}=1/y_H$ $a_{LF}=1/y_F$

		$a_{KH}=\Omega_H$	$a_{KF}=\Omega_F$	y_H / y_F	$\mathbf{a_{LH}}=1/y_H$ / $\mathbf{a_{LF}}=1/y_F$	L_H & L_F	Y_H & Y_F	$K=K_H+K_F$	$L=L_H+L_F$
Case 1.	World	2.2546		9.9797	0.10020	600	5988	13500	600
	H: capital-ample country	2.9199		9.4181	**0.10618**	200.00	1883.63	5500	200
	F: labour-ample country		1.9492	10.2605	**0.09746**	400.00	4104.20	8000	400
Case 2.	World	2.2546		9.9797	0.10020	600	5988	13500	600
	H: capital-ample country	2.9199		9.4181	**0.10618**	200.00	1883.63	5500	200
	F: labour-ample country		1.9492	10.2605	**0.09746**	400.00	4104.20	8000	400
	World	2.2546		9.9797	0.10020	600	5988	13500	600
Case 3.	H: capital-ample country	2.9199		9.4181	**0.10618**	200.00	1883.63	5500	200
	F: labour-ample country		1.9492	10.2605	**0.09746**	400.00	4104.20	8000	400

T10 Case 2. Using r and w with the price level

									5988	
World=S+C			BOP	0	Budget	-250	S-I	250	i/s	0.5833
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	ΔK=I	A(0)
0.00755	600	13500	190	145	335	5652	5988	600	350	8.3829
α	Ω(0)	r(0)	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	i=ΔK/Y	w(0)
0.05600	2.25458	0.02484	22.5000	9.9797	0.10020	0.5681	0.06037	0.03181	0.05845	9.4208
H: capital-ample country			BOP	160	Budget	-150	S-I	310	i/s	0.2250
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	ΔK=I	A(0)
0.00755	200.00	5500.00	131.52	56	187.88	1695.75	1883.63	400.00	90	6.7671
α	$\Omega_H(0)$	r(0)	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	i=ΔK/Y	w(0)
0.09974	2.91990	0.03416	27.5000	9.4181	0.21236	0.7000	0.05137	0.06982	0.04778	8.4787
F: laour-ample country			BOP	-160	Budget	-100	S-I	-60	i/s	1.3000
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	ΔK=I	A(0)
0.00755	400.00	8000.00	58.98	88.47	147.45	3956.74	4104.20	200.00	260	9.2135
α	$\Omega_F(0)$	r(0)	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	i=ΔK/Y	w(0)
0.03593	1.94922	0.01843	20.0000	10.2605	0.04873	0.4000	0.06427	0.01437	0.06335	9.8919
For cases 2 and 3, $Y_H(0)$ and $Y_F(0)$ use each equation.							$Y_{H(0)}/Y_{F(0)}$	0.45895		$\Omega_{H(0)}>\Omega_{F(0)}$

4. The Penrose curve, B_K, and the assets valuation ratio, v

	Ω^*	I/K	g_K *	Slope B_K	r^*	r_{M^*}	Slope A	Slope B_K/A	$v=1/\beta^*$
Case 1. World	2.2546	0.0407	0.0310	1.3144	0.0248	0.0189	1.3144	1.0000	1.3144
H: capital-ample country	2.9199	0.0527	0.0421	1.2512	0.0342	0.0273	1.2512	1.0000	1.2512
F: labour-ample country	1.9492	0.0325	0.0243	1.3383	0.0184	0.0138	1.3383	1.0000	1.3383
Case 2. World	2.2546	0.0259	0.0310	0.8364	0.0248	0.0297	0.8364	1.0000	1.2628
H: capital-ample country	2.9199	0.0164	0.0421	0.3883	0.0342	0.0880	0.3883	1.0000	1.1445
F: labour-ample country	1.9492	0.0325	0.0243	1.3383	0.0184	0.0138	1.3383	1.0000	1.3383
Case 3. World	2.2546	0.0281	0.0310	0.9081	0.0248	0.0274	0.9081	1.0000	1.2736
H: capital-ample country	2.9199	0.0345	0.0421	0.8198	0.0342	0.0417	0.8198	1.0000	1.2242
F: labour-ample country	1.9492	0.0238	0.0243	0.9780	0.0184	0.0188	0.9780	1.0000	1.2897

5. The relative price level: real vs. nominal

				(a)	Inf or def	(b)		(c)	
	$r(0)$	$r=\partial Yt/\partial Kt$	$P_Y=r(0)/r_{real}$	$r_{M(0)\ given}$	$p_Y=r_{M(0)}/r_{rea}$	r_M * at β^*	(a)/(b)	$r_{CB\ given}$	(a)/(c)
Case 1. World	0.02484	0.02484	1.0000	0.0330	1.3285	0.0189	1.7462	0.027	1.2222
H: capital-ample country	0.03416	0.03416	1.0000	0.0330	0.9660	0.0273	1.2087	0.027	1.2222
F: labour-ample country	0.01843	0.01843	1.0000	0.0330	1.7904	0.0138	2.3961	0.027	1.2222
Case 2. World	0.02484	0.02484	1.0000	0.0325	1.3084	0.0197	1.6522	0.027	1.2037
H: capital-ample country	0.03416	0.03416	1.0000	0.0300	0.8782	0.0298	1.0051	0.027	1.1111
F: labour-ample country	0.01843	0.01843	1.0000	0.0330	1.7904	0.0138	2.3961	0.027	1.2222
Case 3. World	0.02484	0.02484	1.0000	0.0310	1.2480	0.0195	1.5895	0.027	1.1481
H: capital-ample country	0.03416	0.03416	1.0000	0.0330	0.9660	0.0279	1.1826	0.027	1.2222
F: labour-ample country	0.01843	0.01843	1.0000	0.0300	1.6276	0.0143	2.0992	0.027	1.1111

Note: If the price level of output, P_Y, is one, real=nominal and the elasticity of substitution, σ, is always 1.0.

6. Relationships between price levels: r_H & w_H for P_H and r_F & w_F for P_F Stolper-Samuelson

For H, $P_H=a_{KH}.r_H+a_{LH}.w_H$ When real=nominal, the price level is 1.0. The elasticity of substitution is 1.0.

For F, $P_F=a_{KF}.r_F+a_{LF}.w_F$

	r_H	r_F	w_H	w_F	P_H	P_F	$p=P_H/P_F$	
Case 1. World	0.02484		9.4208		1.0000		1.0000	For p,
H: capital-ample country	0.03416		8.4787		1	1	1	using goal
F: labour-ample country		0.01843		9.8919				seek
Case 2. World	0.02484		9.4208		1.0000		1.0000	Y(0)
H: capital-ample country	0.03416		8.4787		1	1	1	5988
F: labour-ample country		0.01843		9.8919				5988
Case 3. World	0.02484		9.4208		1.0000		1.0000	Y(0)
H: capital-ample country	0.03416		8.4787		1	1	1	5988
F: labour-ample country		0.01843		9.8919				5988

T10 Case 3. Using r and w with the price level

									5988	
World=S+C			BOP	70	Budget	-150	S-I	220	i/s	0.6333
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	ΔK=I	A(0)
0.00755	600	13500	190	145	335	5652	5988	600	380	8.3829
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	i=ΔK/Y	w(0)
0.05600	2.25458	0.02484	22.5000	9.9797	0.10020	0.5681	0.06555	0.03181	0.06346	9.4208
H: capital-ample country			BOP	160	Budget	-50	S-I	210	i/s	0.4750
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	ΔK=I	A(0)
0.00755	200.00	5500.00	131.52	56	187.88	1695.75	1883.63	400.00	190	6.7671
α	$\Omega_H(0)$	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	i=ΔK/Y	w(0)
0.09974	2.91990	0.03416	27.5000	9.4181	0.21236	0.7000	0.10844	0.06982	0.10087	8.4787
F: laour-ample country			BOP	-90	Budget	-100	S-I	10	i/s	0.9500
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	ΔK=I	A(0)
0.00755	400.00	8000.00	58.98	88.47	147.45	3956.74	4104.20	200.00	190	9.2135
α	$\Omega_F(0)$	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	i=ΔK/Y	w(0)
0.03593	1.94922	0.01843	20.0000	10.2605	0.04873	0.4000	0.04697	0.01437	0.04629	9.8919
$P_H=\Omega_H \cdot r_H+(1/y_H)w_H$			$P_F=\Omega_F \cdot r_F+(1/y_F)w_F$				$Y_{H(0)}/Y_{F(0)}$	0.45895		$\Omega_{H(0)}>\Omega_{F(0)}$

7. The neutrality of financial assets and the coeffcient x=r/w ke*=Ω*^(1/(1−α)) $x_e^*/x_0=k(0)/ke^*$

	r_{CB} given	r_M^* at β^*	r^*/r_{M^*}	$c_{CB}=r_M^*/r_{CB}$	α_x	$x_0=\alpha_x/k(0$	ke*	$x_e^*=\alpha_x/ke^*$	x_0/x_e^*
Case 1. World	0.027	0.0189	1.3144	0.69994	0.0593	0.0026	2.3660	0.0251	0.1052
H: capital-ample country	0.027	0.0273	1.2512	1.01118	0.1108	0.0040	3.2880	0.0337	0.1196
F: labour-ample country	0.027	0.0138	1.3383	0.51008	0.0373	0.0019	1.9983	0.0186	0.0999
					$\alpha_x=\alpha/(1-\alpha)$				
Case 2. World	0.027	0.0197	0.8364	1.09990	0.0593	0.0026	2.3660	0.0251	0.1052
H: capital-ample country	0.027	0.0298	0.3883	3.25823	0.1108	0.0040	3.2880	0.0337	0.1196
F: labour-ample country	0.027	0.0138	1.3383	0.51008	0.0373	0.0019	1.9983	0.0186	0.0999
Case 3. World	0.027	0.0195	0.9081	1.01307	0.0593	0.0026	2.3660	0.0251	0.1052
H: capital-ample country	0.027	0.0279	0.8198	1.54337	0.1108	0.0040	3.2880	0.0337	0.1196
F: labour-ample country	0.027	0.0143	0.9780	0.69801	0.0373	0.0019	1.9983	0.0186	0.0999

Note: When the effective labour is used, the coefficient, x_0 and x_e, are connected with ke(0) (see also below).

8. Data for the Heckser-Ohlin, Rybczynski, the Stolper-Samuelson, and Leontief paradox

$p=P_M/P_F=1$	k(0)	Δk/k(0)		*sigma*	w(0)	w(0)/r(0)	r(0)/w(0)	k/(w/r)	α_x(w/r)
Case 1. World	22.5000	(Δ(w/r)/(w/r)			9.4208	379.27	0.0026	0.0593	22.5000
H: capital-ample country	27.5000	0.0000	0.0000	#DIV/0!	8.4787	248.21	0.0040	0.1108	27.5000
F: labour-ample country	20.0000	0.0000	0.0000	#DIV/0!	9.8919	536.68	0.0019	0.0373	20.0000
							$=\alpha/(1-\alpha)=\alpha_x$		=k(0)
Case 2. World	22.5000				9.4208	379.27	0.0026	0.0593	22.5000
H: capital-ample country	27.5000	0.0000	0.0000	#DIV/0!	8.4787	248.21	0.0040	0.1108	27.5000
F: labour-ample country	20.0000	0.0000	0.0000	#DIV/0!	9.8919	536.68	0.0019	0.0373	20.0000
Case 3. World	22.5000				9.4208	379.27	0.0026	0.0593	22.5000
H: capital-ample country	27.5000	0.0000	0.0000	#DIV/0!	8.4787	248.21	0.0040	0.1108	27.5000
F: labour-ample country	20.0000	0.0000	0.0000	#DIV/0!	9.8919	536.68	0.0019	0.0373	20.0000

Note: When the effective labour is used, the current wage rate and the profit rate are connected with *k*(0).

9. Introduction of relative price level, $p=P_H/P_F$: Duality [Jones, R. W., 1965] S-Samuelson [1941]

$r_F=r_F(0)=\partial Y_F/\partial K_F$ $r_H(0)_{nominal}=p\cdot(\partial Y_H/\partial K_H)$, where $p=P_H/P_F$ $w_F=w_F(0)=\partial Y_F/\partial L_F$ $w_{H(0)nominal}=p\cdot(\partial Y_H/\partial L_H)$

	Marginal productivity	$r_{H(marg.pro.)}$	$r_{F(margi.Pro.)}$	$w_{H(margi.Pro.}$	$w_{F(matgi.pro.)}$	P_H	P_F	$p=P_H/P_F$	Changes (%)
Case 1.	World	0.02484		9.4208		1.0000		1.0000	for r & w
	H: capital-ample country	0.03416		8.4787		1		1	1.0000
	F: labour-ample country		0.01843		9.8919		1		1.0000
Case 2.	World	0.02484		9.4208		1.0000		1.0000	1.0000
	H: capital-ample country	**0.03416**		8.4787		1.0000		1.0000	1.0000
	F: labour-ample country		0.01843		9.8919		1		1.0000
Case 3.	World	0.02484		9.4208		1.0000		1.0000	1.0000
	H: capital-ample country	0.03416		8.4787		1.0000		1.0000	1.0000
	F: labour-ample country		0.01843		**9.8919**		1		1.0000

T11 Case 1. Both countries have different rates of profit and the wage rates

									5988	p>1
World=S+C			BOP	0	Budget	-50	S-I	50	i/s	0.9167
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	Y(0)	S(0)	$\Delta K=I$	A(0)
0.00755	600	13500	190	145	335	5652	5988	600	550	8.3829
α	$\Omega(0)$	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$i=\Delta K/Y$	w(0)
0.05600	2.25458	0.02484	22.5000	9.9797	0.10020	0.5681	0.09487	0.03181	0.09185	9.4208
S: saving-oriented country			BOP	160	Budget	50	S-I	110	i/s	0.7250
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_H(0)$	S(0)	$\Delta K=I$	A(0)
0.00755	200.00	5500.00	131.52	56	187.88	1695.75	1883.63	400.00	290	6.7671
α	$\Omega_H(0)$	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$i=\Delta K/Y$	w(0)
0.09974	2.91990	0.03416	27.5000	9.4181	0.21236	0.7000	0.16551	0.06982	0.15396	8.4787
C: consumption-oriented co			BOP	-160	Budget	-100	S-I	-60	i/s	1.3000
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_F(0)$	S(0)	$\Delta K=I$	A(0)
0.00755	400.00	8000.00	58.98	88.47	147.45	3956.74	4104.20	200.00	260	9.2135
α	$\Omega_F(0)$	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$i=\Delta K/Y$	w(0)
0.03593	1.94922	0.01843	20.0000	10.2605	0.04873	0.4000	0.06427	0.01437	0.06335	9.8919
Balance of payment=household saving+government deficit							$Y_{H(0)}/Y_{F(0)}$	0.45895	**Uzawa [1962]: $\Omega_H>\Omega_F$**	

経常収支赤字＝国民の貯蓄不足＋政府の財政赤字

1. Basic variables and parameters under convergence (*delta=alpha*)

		$g_Y{}^*=g_K{}^*$	$g_A{}^*$	$g_y{}^*$	Ω^*	r^*	i	$\beta^*{}_{(\delta=\alpha)}$	n	α
Case 1.	World	0.0310	0.0220	0.0233	2.2546	0.0248	0.09185	0.7608	0.00755	0.05600
H: capital-ample country		0.0421	0.0309	0.0343	2.9199	0.0342	0.15396	0.7992	0.00755	0.09974
F: labour-ample country		0.0243	0.0160	0.0166	1.9492	0.0184	0.06335	0.7472	0.00755	0.03593
							adjusting i by using $\theta_{1=1.0}$:			
Case 2.	World	0.0216	0.0097	0.0140	2.2689	0.1333	0.05882	0.8343	0.00755	0.30252
H: capital-ample country		0.0147	0.0045	0.0071	2.7500	0.1333	0.04500	0.8998	0.00755	0.36667
F: labour-ample country		0.0259	0.0133	0.0182	2.0253	0.1333	0.06582	0.7977	0.00755	0.27004
							adjusting i by using $\theta_{1=1.0}$:			
Case 3.	World	0.0254	0.0056	0.0177	2.0611	0.3313	0.05802	0.9030	0.00755	0.68290
H: capital-ample country		0.0324	0.0051	0.0247	2.3913	0.3313	0.08261	0.9380	0.00755	0.79232
F: labour-ample country		0.0211	0.0050	0.0134	1.8824	0.3313	0.04471	0.8870	0.00755	0.62369

2. Basic variables and parameters under the current situation (*delta>alpha*)

		$g_{Y(a)}$	$g_{K(a)}$	$g_{A(a)}$	$g_{y(a)}$	*delta*	$\beta_{actual\ (\delta>\alpha)}$	$\beta^*-\beta$	$k(0)$	$y(0)$
Case 1.	World	0.0800	0.3000	0.0561	0.0718	0.2568	-0.14069	0.9015	22.5000	9.9797
H: capital-ample country		0.0400	0.4000	0.0307	0.0322	0.0221	0.84572	-0.0465	27.5000	9.4181
F: labour-ample country		0.0482	0.4374	0.0252	0.0404	0.4266	-0.28388	1.0311	20.0000	10.2605
For min capital-goods growth			0.0248							
Case 2.	World	0.0800	0.3000	-0.0160	0.0718	-8.3114	1.00000	-0.1657	22.5000	9.9167
H: capital-ample country		0.0400	0.4000	-0.1114	0.0322	-27.7657	1.00000	-0.1002	27.5000	10.0000
F: labour-ample country		0.0474	-4.6674	1.3023	0.0396	-4.6399	0.99999	-0.2023	20.0000	9.8750
Case 3.	World	0.0800	0.3000	-0.1273	0.0718	-80.8877	1.00000	-0.0970	22.5000	10.9167
H: capital-ample country		0.0400	0.4000	-0.2785	0.0322	-120.265	1.00000	-0.0620	27.5000	11.5000
F: labour-ample country		0.0469	-75.4719	47.1148	0.0390	-74.9141	1.00000	-0.1130	20.0000	10.6250

$g_{A(a)}=g_{Y(a)}-\alpha g_{K(a)}-(1-\alpha)n$ delta=(n+α(i-iβ*-n))/(i(1-β*)) $\beta_{actual(\delta>\alpha)}=1-((1/i)(g_{A(a)}k(0)^{\wedge}(\delta-\alpha))$

3. Relationships between quantities: K_H & K_F and L_H & L_F

$K=(a_{KH}\cdot y_H)L_H+(a_{KF}\cdot y_F)L_F$ $K=a_{KH}\cdot Y_H+a_{KF}\cdot Y_F$

$L=(a_{LH}\cdot y_H)L_H+(a_{LF}\cdot y_F)L_F$ $L=a_{LH}\cdot Y_H+a_{LF}\cdot Y_F$

For K,	$a_{KH}=\Omega_H$ $a_{KF}=\Omega_F$			y_H	$\mathbf{a_{LH}}=1/y_H$				
For L,	$a_{LH}=1/y_H$ $a_{LF}=1/y_F$	$a_{KH}=\Omega_H$	$a_{KF}=\Omega_F$	y_F	$\mathbf{a_{LF}}=1/y_F$	L_H &L_F	Y_H &Y_F	$K=K_H+K_F$	$L=L_H+L_F$
Case 1.	World	2.2546		9.9797	0.10020	600	5988	13500	600
	H: capital-ample country	2.9199		9.4181	**0.10618**	200.00	1883.63	5500	200
	F: labour-ample country		1.9492	10.2605	**0.09746**	400.00	4104.20	8000	400
Case 2.	World	2.2689		9.9167	0.10084	600	5950	13500	600
	H: capital-ample country	2.7500		10.0000	**0.10000**	200.00	2000.00	5500	200
	F: labour-ample country		2.0253	9.8750	**0.10127**	400.00	3950.00	8000	400
	World	2.0611		10.9167	0.09160	600	6550	13500	600
Case 3.	H: capital-ample country	2.3913		11.5000	**0.08696**	200.00	2300.00	5500	200
	F: labour-ample country		1.8824	10.6250	**0.09412**	400.00	4250.00	8000	400

T11 Case 2. Using r and w with the price level

									5925	
World=S+C			BOP	0	Budget	-250	S-I	250	i/s	0.5833
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	ΔK=I	A(0)
0.00755	600	13500	940	860	1800.00	4125.00	5950.00	600	350	3.8664
α	Ω(0)	r(0)	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	i=ΔK/Y	w(0)
0.30252	2.26891	0.13333	22.5000	9.9167	0.10084	0.5222	0.06986	0.15798	0.05882	6.8750
H: capital-ample country			BOP	160	Budget	-150	S-I	310	i/s	0.2250
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	ΔK=I	A(0)
0.00755	200.00	5500.00	513.33	220	733.33	1375.00	2000.00	400.00	90	2.9665
α	$\Omega_H(0)$	r(0)	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	i=ΔK/Y	w(0)
0.36667	2.75000	0.13333	27.5000	10.0000	0.20000	0.7000	0.06054	0.25667	0.04500	6.8750
F: laour-ample country			BOP	-160	Budget	-100	S-I	-60	i/s	1.3000
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	ΔK=I	A(0)
0.00755	400.00	8000.00	426.67	640.00	1066.67	2750.00	3950.00	200.00	260	4.3975
α	$\Omega_F(0)$	r(0)	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	i=ΔK/Y	w(0)
0.27004	2.02532	0.13333	20.0000	9.8750	0.05063	0.4000	0.07379	0.10802	0.06582	6.8750
For cases 2 and 3, $Y_H(0)$ and $Y_F(0)$ must be given (without using eac							$Y_{H(0)}/Y_{F(0)}$	0.50633		$\Omega_{H(0)}>\Omega_{F(0)}$

4. The Penrose curve, B_K, and the assets valuation ratio, v

	Ω*	I/K	g_K*	Slope B_K	r*	r_{M^*}	Slope A	Slope B_K/A	$v=1/\beta^*$
Case 1. World	2.2546	0.0407	0.0310	1.3144	0.0248	0.0189	1.3144	1.0000	1.3144
H: capital-ample country	2.9199	0.0527	0.0421	1.2512	0.0342	0.0273	1.2512	1.0000	1.2512
F: labour-ample country	1.9492	0.0325	0.0243	1.3383	0.0184	0.0138	1.3383	1.0000	1.3383
Case 2. World	2.2689	0.0259	0.0393	0.6600	0.1342	0.2033	0.6600	1.0000	1.1986
H: capital-ample country	2.7500	0.0164	0.0567	0.2885	0.1333	0.4622	0.2885	1.0000	1.1114
F: labour-ample country	2.0253	0.0325	0.0297	1.0960	0.1333	0.1216	1.0960	1.0000	1.2536
Case 3. World	2.0611	0.0281	0.0774	0.3639	0.3029	0.8324	0.3639	1.0000	1.1074
H: capital-ample country	2.3913	0.0345	0.1575	0.2193	0.3313	1.5107	0.2193	1.0000	1.0661
F: labour-ample country	1.8824	0.0238	0.0504	0.4710	0.3313	0.7035	0.4710	1.0000	1.1273

5. The relative price level: real vs. nominal

				(a)	Inf or def	(b)		(c)	
	r(0)	r=∂Yt/∂Kt	P_Y=r(0)/r real	$r_{M(0)\ given}$	$p_Y=r_{M(0)}/r$ rea	r_M* at β*	(a)/(b)	$r_{CB\ given}$	(a)/(c)
Case 1. World	0.02484	0.02484	1.0000	0.0330	1.3285	0.0189	1.7462	0.027	1.2222
H: capital-ample country	0.03416	0.03416	1.0000	0.0330	0.9660	0.0273	1.2087	0.027	1.2222
F: labour-ample country	0.01843	0.01843	1.0000	0.0330	1.7904	0.0138	2.3961	0.027	1.2222
Case 2. World	0.13333	0.13333	1.0000	0.0325	0.2438	0.1119	0.2903	0.027	1.2037
H: capital-ample country	0.13333	0.13333	1.0000	0.0300	0.2250	0.1200	0.2501	0.027	1.1111
F: labour-ample country	0.13333	0.13333	1.0000	0.0330	0.2475	0.1064	0.3103	0.027	1.2222
Case 3. World	0.33133	0.33133	1.0000	0.0310	0.0936	0.2735	0.1133	0.027	1.1481
H: capital-ample country	0.33133	0.33133	1.0000	0.0330	0.0996	0.3108	0.1062	0.027	1.2222
F: labour-ample country	0.33133	0.33133	1.0000	0.0300	0.0905	0.2939	0.1021	0.027	1.1111

Note: If the price level of output, P_Y, is one, real=nominal and the elasticity of substitution, σ, is always 1.0.

6. Relationships between price levels: r_H & w_H for P_H and r_F & w_F for P_F Stolper-Samuelson

For H,	$P_H=a_{KH}.r_H+a_{LH}.w_H$	When real=nominal, the price level is 1.0.				The elasticity of substitution is 1.0.			
For F,	$P_F=a_{KF}.r_F+a_{LF}.w_F$	r_H	r_F	w_H	w_F	P_H	P_F	$p=P_H/P_F$	
Case 1.	World	0.02484		9.4208		1.0000		1.0000	For p,
	H: capital-ample country	0.03416		8.4787		1	1	1	using goal
	F: labour-ample country		0.01843		9.8919				seek
Case 2.	World	0.13333		6.8750		0.9958		0.9958	Y(0)
	H: capital-ample country	0.13333		6.8750		**1.1**		1.1	5925
	F: labour-ample country		0.13333		6.8750		**1**		5950
Case 3.	World	0.33133		3.9983		1.0492		1.0492	Y(0)
	H: capital-ample country	0.33133		3.9983		**1.14**		1.14	6872
	F: labour-ample country		0.33133		3.9983		**1**		6550

T11 Case 3. Using r and w with the price level

									6872	
World=S+C			BOP	70	Budget	-150	S-I	220	i/s	0.6333
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	Y(0)	S(0)	$\Delta K=I$	A(0)
0.00755	600	13500	2336	2137	4473.00	2399.00	6550.00	600	380	1.3022
α	$\Omega(0)$	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$i=\Delta K/Y$	w(0)
0.68290	2.06107	0.33133	22.5000	10.9167	0.09160	0.5222	0.09017	0.35663	0.05802	3.9983
H: capital-ample country			BOP	160	Budget	-50	S-I	210	i/s	0.4750
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_H(0)$	S(0)	$\Delta K=I$	A(0)
0.00755	200.00	5500.00	1275.63	547	1822.33	799.67	2300.00	400.00	190	0.8323
α	$\Omega_H(0)$	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$i=\Delta K/Y$	w(0)
0.79232	2.39130	0.33133	27.5000	11.5000	0.17391	0.7000	0.18548	0.55462	0.08261	3.9983
F: laour-ample country			BOP	-90	Budget	-100	S-I	10	i/s	0.9500
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_F(0)$	S(0)	$\Delta K=I$	A(0)
0.00755	400.00	8000.00	1060.27	1590.40	2650.67	1599.33	4250.00	200.00	190	1.6402
α	$\Omega_F(0)$	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$i=\Delta K/Y$	w(0)
0.62369	1.88235	0.33133	20.0000	10.6250	0.04706	0.4000	0.05957	0.24947	0.04471	3.9983
$P_H=\Omega_H \cdot r_H+(1/y_H)w_H$			$P_F=\Omega_F \cdot r_F+(1/y_F)w_F$				$Y_{H(0)}/Y_{F(0)}$	0.54118		$\Omega_{H(0)}>\Omega_{F(0)}$

7. The neutrality of financial assets and the coeffcient x=r/w $ke*=\Omega*\hat{}(1/(1-\alpha))$ $x_e*/x_0=k(0)/ke*$

		r_{CB} given	r_M* at β*	$r*/r_{M*}$	$c_{CB}=r_M*/r_{CB}$	α_x	$x_0=\alpha_x/k(0$	ke*	$x_e^*=\alpha_x/ke^*$	x_0/x_e^*
Case 1.	World	0.027	0.0189	1.3144	0.69994	0.0593	0.0026	2.3660	0.0251	0.1052
	H: capital-ample country	0.027	0.0273	1.2512	1.01118	0.1108	0.0040	3.2880	0.0337	0.1196
	F: labour-ample country	0.027	0.0138	1.3383	0.51008	0.0373	0.0019	1.9983	0.0186	0.0999
						$\alpha_x=\alpha/(1-\alpha)$				
Case 2.	World	0.027	0.1119	0.6600	7.53023	0.4337	0.0193	3.2370	0.1340	0.1439
	H: capital-ample country	0.027	0.1200	0.2885	#######	0.5789	0.0040	4.9395	0.1172	0.0344
	F: labour-ample country	0.027	0.1064	1.0960	4.50553	0.3699	0.0019	2.6295	0.1407	0.0132
Case 3.	World	0.027	0.2735	0.3639	#######	2.1536	0.0026	9.7840	0.2201	0.0120
	H: capital-ample country	0.027	0.3108	0.2193	#######	3.8151	0.0040	66.5510	0.0573	0.0703
	F: labour-ample country	0.027	0.2939	0.4710	#######	1.6574	0.0019	5.3701	0.3086	0.0060

Note: When the effective labour is used, the coefficient, x_0 and x_e, are connected with ke(0) (see also below).

8. Data for the Hecksher-Ohlin, Rybczynski, the Stolper-Samuelson, and Leontief paradox

$p=P_M/P_F=1$		k(0)	$\Delta k/k(0)$		*sigma*	w(0)	w(0)/r(0)	r(0)/w(0)	k/(w/r)	α_x(w/r)
Case 1.	World	22.5000	$(\Delta(w/r)/(w/r)$			9.4208	379.27	0.0026	0.0593	22.5000
	H: capital-ample country	27.5000	0.0000	0.0000	#DIV/0!	8.4787	248.21	0.0040	0.1108	27.5000
	F: labour-ample country	20.0000	0.0000	0.0000	#DIV/0!	9.8919	536.68	0.0019	0.0373	20.0000
								$=\alpha/(1-\alpha)=\alpha_x$		=k(0)
Case 2.	World	22.5000				6.8750	51.56	0.0194	0.4364	22.3645
	H: capital-ample country	27.5000	0.0000	(0.7923)	0.0000	6.8750	51.56	0.0194	0.5333	29.8520
	F: labour-ample country	20.0000	0.0000	(0.9039)	0.0000	6.8750	51.56	0.0194	0.3879	19.0751
Case 3.	World	22.5000				3.9983	12.07	0.0829	1.8645	25.9882
	H: capital-ample country	27.5000	0.0000	(0.9514)	0.0000	3.9983	12.07	0.0829	2.2789	46.0380
	F: labour-ample country	20.0000	0.0000	(0.9775)	0.0000	3.9983	12.07	0.0829	1.6574	20.0000

Note: When the effective labour is used, the current wage rate and the profit rate are connected with *k*(0).

9. Introduction of relative price level, $p=P_H/P_F$: Duality [Jones, R. W., 1965] S-Samuelson [1941]

$r_F=r_F(0)=\partial Y_F/\partial K_F$ $r_H(0)_{nominal}=p\cdot(\partial Y_H/\partial K_H)$, where $p=P_H/P_F$ $w_F=w_F(0)=\partial Y_F/\partial L_F$ $w_{H(0)nominal}=p\cdot(\partial Y_H/\partial L_H)$

	Marginal productivity	$r_{H(marg.pro.)}$	$r_{F(margi.Pro.)}$	$w_{H(margi.Pro.}$	$w_{F(matgi.pro.)}$	P_H	P_F	$p=P_H/P_F$	Changes (%)
Case 1.	World	0.02484		9.4208		1.0000		1.0000	for r & w
	H: capital-ample country	0.03416		8.4787		1		1	3.7026
	F: labour-ample country		0.01843		9.8919		1		8.5083
Case 2.	World	0.13390		6.9040		0.9958		0.9958	7.2339
	H: capital-ample country	**0.12648**		6.5217		1.0542		1.0542	17.9763
	F: labour-ample country		0.13333		6.8750		1		0.7692
Case 3.	World	0.31581		3.8110		1.0492		1.0492	0.4137
	H: capital-ample country	0.29064		3.5073		1.1400		1.1400	0.6950
	F: labour-ample country		0.33133		**3.9983**		1		0.4042

T12 Case 1. Both regions have different rates of profit and the wage rates **Findlay [1960]**

Country=capital-goods+consumption-goods: T=H+F $A(0)=k(0)^{1-\alpha}/\Omega(0)$

n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	$\Pi(0)$	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5652	6152	616	316	4.0295
α	$\Omega(0)$	r(0)	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08127	1.59558	0.05094	7.5799	4.7506	0.10013	0.6000	0.05400	0.04876	0.05137	4.3645
H: capital-goods		0.3	s=S/Y	0.10013	0.36	0.39		0.33		
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	$\Pi(0)$	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	129.67	2944.80	126.00	54	180.00	2204.28	2384.28	203.28	77.28	14.5257
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.07549	1.23509	0.06112	22.7102	18.3875	0.08526	0.7000	0.03422	0.05285	0.03241	16.9994
F: consumption-goods			1-s	0.89987						
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	$\Pi(0)$	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1165.33	6871.20	174.00	146.00	320.00	3447.72	3767.72	412.72	238.72	2.7809
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.08493	1.82370	0.04657	5.8963	3.2332	0.10954	0.5438	0.06643	0.04618	0.06336	2.9586
Cases correspond with Hecksher-Ohlin by region.							$Y_{H(0)}/Y_{F(0)}$	0.63282		$\Omega_{H(0)}<\Omega_{F(0)}$

1. Basic variables and parameters under convergence (*delta=alpha*)

	$g_Y^*=g_K^*$	g_A^*	g_y^*	Ω^*	r^*	i	$\beta^*_{(\delta=\alpha)}$	n	α
Case 1. Total	0.0386	0.0283	0.0308	1.5956	0.0509	0.08986	0.6851	0.00755	0.08127
H: capital-goods	0.0398	0.0296	0.0320	1.2351	0.0611	0.07878	0.6242	0.00755	0.07549
F: consumption-goo	0.0380	0.0276	0.0302	1.8237	0.0466	0.09687	0.7148	0.00755	0.08493
Case 2. Total	0.0386	0.0283	0.0308	1.5956	0.0509	0.08986	0.6851	0.00755	0.08127
H: capital-goods	0.0360	0.0267	0.0282	1.0136	0.0509	0.06320	0.5768	0.00755	0.05163
F: consumption-goo	0.0397	0.0287	0.0319	1.9490	0.0509	0.10604	0.7292	0.00755	0.09927
Case 3. Total	0.0387	0.0284	0.0309	1.6107	0.0509	0.09071	0.6871	0.00755	0.08204
H: capital-goods	0.0571	0.0420	0.0492	2.2986	0.0638	0.17324	0.7577	0.00755	0.14665
F: consumption-goo	0.0322	0.0228	0.0244	1.4276	0.0454	0.06874	0.6678	0.00755	0.06485

2. Basic variables and parameters under the current situation (*delta>alpha*)

	$g_{Y(a)}$	$g_{K(a)}$	$g_{A(a)}$	$g_{y(a)}$	delta	$\beta_{actual\ (\delta>\alpha)}$	$\beta^*-\beta$	$k(0)$	$y(0)$
Case 1. Total	0.0800	0.3000	0.0487	0.0718	0.1146	0.42042	0.2647	7.5799	4.7506
H: capital-goods	0.0400	0.4000	0.0292	0.0322	0.1379	0.54990	0.0743	22.7102	18.3875
F: consumption-goo	-0.0703	0.1053	-0.0862	-0.0773	0.0970	1.90875	-1.1940	5.8963	3.2332
For min capital good growth		0.0509							
Case 2. Total	0.0800	0.3000	0.0487	0.0718	0.1146	0.42042	0.2647	7.5799	4.7506
H: capital-goods	0.0400	0.4000	0.0122	0.0322	0.2341	0.67260	-0.0958	18.1682	17.9248
F: consumption-goo	-0.0645	0.0266	-0.0740	-0.0715	0.0189	1.60086	-0.8717	6.4017	3.2847
Case 3. Total	0.0800	0.3000	0.0485	0.0718	0.1108	0.43373	0.2534	7.5799	4.7060
H: capital-goods	0.0400	0.4000	-0.0251	0.0322	-0.1859	1.06348	-0.3058	11.9609	5.2036
F: consumption-goo	0.0451	0.2203	0.0237	0.0372	0.2112	0.54597	0.1218	6.5515	4.5892

$g_{A(a)}=g_{Y(a)}-\alpha g_{K(a)}-(1-\alpha)n$ delta=$(n+\alpha(i-i\beta^*-n))/(i(1-\beta^*))$ $\beta_{actual(\delta>\alpha)}=1-((1/i)(g_{A(a)}k(0)\hat{}(\delta-\alpha))$

3. Relationships between quantities: K_H & K_F and L_H & L_F $K=(a_{KH}\cdot y_H)L_H+(a_{KF}\cdot y_F)L_F$ $L=(a_{LH}\cdot y_H)L_H+(a_{LF}\cdot y_F)L_F$

Heckscher-Ohlin: $K=a_{KH}\cdot Y_H+a_{KF}\cdot Y_F$ $L=a_{LH}\cdot Y_H+a_{LF}\cdot Y_F$

For K, $a_{KH}=\Omega_H$ $a_{KF}=\Omega_F$
For L, $a_{LH}=1/y_H$ $a_{LF}=1/y_F$

		$a_{KH}=\Omega_H$	$a_{KF}=\Omega_F$	y_H / y_F	$a_{LH}=1/y_H$ / $a_{LF}=1/y_F$	L_H & L_F	Y_H & Y_F	$K=K_H+K_F$	$L=L_H+L_F$
Case 1.	Total	1.5956		4.7506	0.21050	1295	6152	9816	1295
	H: capital-goods	1.2351		18.3875	**0.05438**	129.67	2384.28	2945	130
	F: consumption-goods		1.8237	3.2332	**0.30929**	1165.33	3767.72	6871	1165
Case 2.	Total	1.5956		4.7506	0.21050	1295	6152	9816	1295
	H: capital-goods	1.0136		17.9248	**0.05579**	129.67	2324.29	2356	130
	F: consumption-goods		1.9490	3.2847	**0.30445**	1165.33	3827.71	7460	1165
Case 3.	Total	1.6107		4.7060	0.21250	1295	6094	9816	1295
	H: capital-goods	2.2986		5.2036	**0.19217**	246.20	1281.14	2945	246
	F: consumption-goods		1.4276	4.5892	**0.21790**	1048.80	4813.11	6871	1049

T12 Case 2. K decreases in capital-goods by 20% **Findlay [1960]**

Country=capital-goods+consumption-goods: T=H+F							ΔY(0)/Y(0)	0.00000	$A(0)=k(0)^{1-\alpha}/\Omega(0)$	
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5652	6152	616	316	4.0295
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08127	1.59558	0.05094	7.5799	4.7506	0.10013	0.6000	0.05400	0.04876	0.05137	4.3645
H: capital-goods			ΔK/K:	-0.2			$\Delta Y_{H(0)}/Y_{H(0)}$	-0.02516		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	129.67	2355.84	84.00	36	**120.01**	2204.28	2324.29	162.62	78.62	15.4325
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.05163	1.01358	**0.05094**	18.1682	17.9248	0.06997	0.7000	0.03509	0.03614	0.03383	16.9994
F: consumption-goods	Using goal seek, where r_H approaches $r=r_F$						$\Delta Y_{F(0)}/Y_{F(0)}$	0.01592		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1165.33	7460.16	216.00	164.00	379.99	3447.72	3827.71	453.38	237.38	2.7318
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.09927	1.94899	0.05094	6.4017	3.2847	0.11845	0.5684	0.06573	0.05643	0.06202	2.9586
							$Y_{H(0)}/Y_{F(0)}$	0.60723		$\Omega_{H(0)}<\Omega_{F(0)}$

4. The Penrose curve, B_K, and the assets valuation ratio, v

		Ω*	I/K	g_K*	Slope B_K	r*	r_{M*}	Slope A	Slope B_K/A	$v=1/\beta^*$
Case 1.	Total	1.5956	0.0563	0.0386	1.4597	0.0509	0.0349	1.4597	1.0000	1.4597
H: capital-goods		1.2351	0.0638	0.0398	1.6021	0.0611	0.0382	1.6021	1.0000	1.6021
F: consumption-goo		1.8237	0.0531	0.0380	1.3990	0.0466	0.0333	1.3990	1.0000	1.3990
Case 2.	Total	1.5956	0.0563	0.0386	1.4597	0.0509	0.0349	1.4597	1.0000	1.4597
H: capital-goods		1.0136	0.0624	0.0390	1.5989	0.0509	0.0319	1.5989	1.0000	1.7338
F: consumption-goo		1.9490	0.0544	0.0385	1.4150	0.0509	0.0360	1.4150	1.0000	1.3714
Case 3.	Total	1.6107	0.0563	0.0386	1.4587	0.0514	0.0353	1.4587	1.0000	1.4553
H: capital-goods		2.2986	0.0754	0.0425	1.7733	0.0638	0.0360	1.7733	1.0000	1.3198
F: consumption-goo		1.4276	0.0482	0.0373	1.2904	0.0454	0.0352	1.2904	1.0000	1.4975

5. The relative price level: real vs. nominal

					(a)	Inf. or def	(b)		(c)	
		r(0)	r=∂Yt/∂Kt	P_Y=r(0)/r real	$r_{M(0)\ given}$	$P_Y=r_{M(0)}/r$ rea	r_M* at β*	(a)/(b)	r_{CB} goal see	(a)/(c)
Case 1.	Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0349	0.9457	0.0317	1.0394
H: capital-goods		0.06112	0.06112	1.0000	0.0330	0.5399	0.0382	0.8649	0.0347	0.9507
F: consumption-goo		0.04657	0.04657	1.0000	0.0330	0.7086	0.0333	0.9913	0.0303	1.0896
Case 2.	Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0349	0.9457	0.0317	1.0407
H: capital-goods		0.05094	0.05094	1.0000	0.0330	0.6478	0.0294	1.1232	0.0290	1.1396
F: consumption-goo		0.05094	0.05094	1.0000	0.0330	0.6479	0.0371	0.8885	0.0327	1.0084
Case 3.	Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0353	0.9340	0.0320	1.0304
H: capital-goods		0.06380	0.06380	1.0000	0.0330	0.5172	0.0483	0.6826	0.0327	1.0089
F: consumption-goo		0.04542	0.04542	1.0000	0.0330	0.7265	0.0303	1.0879	0.0320	1.0318

Note: If the price level of output, P_Y, is one, real=nominal and the elasticity of substitution, σ, is always 1.0.

$r(real)=\partial Yt/\partial Kt=\alpha AtKt^{\alpha-1}Lt^{1-\alpha}$ and $w(real)=\partial Yt/\partial Lt=(1-\alpha)AtKt^{\alpha}Lt^{-\alpha}$

6. Relationships between price levels: r_H & w_H for P_H and r_F & w_F for P_F **Rybczynski**

For H, $P_H=a_{KH}.r_H+a_{LH}.w_H$ When real=nominal, the price level is 1.0. The elasticity of substitution is 1.0.

For F, $P_F=a_{KF}.r_F+a_{LF}.w_F$

		r_H	r_F	w_H	w_F	P_H	P_F	$p=P_H/P_F$
Case 1.	Total							
	H: capital-goods	0.06112		16.9994		1		1
	F: consumption-goods		0.04657		2.9586		1	
Case 2.	Total							
	H: capital-goods	0.05094		16.9994		1		1
	F: consumption-goods		0.05094		2.9586		1	
Case 3.	Total							
	H: capital-goods	0.06380		4.4405		1		1
	F: consumption-goods		0.04542		4.2916		1	

T12 Case 3. L decreases in consumption-goods by 10% **Uzawa [1962]**

Country=capital-goods+consumption-goods: T=H+F							ΔY(0)/Y(0)	-0.00939		A(0)=k(0)^{1−α}/Ω(0)
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5594	6094	616	316	3.9855
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08204	1.61070	0.05094	7.5799	4.7060	0.10108	0.6000	0.05454	0.04923	0.05185	4.3199
H: capital-goods							$\Delta Y_{H(0)}/Y_{H(0)}$	-0.46267		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	246.20	2944.80	131.52	56	187.88	**1093.26**	1281.14	244.55	113.04	3.6162
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.14665	2.29857	0.06380	11.9609	5.2036	0.19089	0.7000	0.09832	0.10266	0.08823	**4.4405**
F: consumption-goods			ΔL/L:	-0.1			$\Delta Y_{F(0)}/Y_{F(0)}$	0.27746		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1048.80	6871.20	168.48	143.64	312.12	**4500.99**	4813.11	371.45	202.96	4.0625
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.06485	1.42760	0.04542	6.5515	4.5892	0.07717	0.5398	0.04370	0.03501	0.04217	**4.2916**
							$Y_{H(0)}/Y_{F(0)}$	0.26618		$\Omega_{H(0)}>\Omega_{F(0)}$

Using goal seek, where w_F approaches $w=w_H$

7. The neutrality of financial assets and the coeffcient *x=r/w*

ke*=Ω*^(1/(1−α)) $x_e*/x_0=k(0)/ke*$

	r_{CB} goal see	r_M* at β*	$r*/r_{M*}$	$c_{CB}=r_M*/r_{CB}$	α_x	$x_0=\alpha_x/k(0$	ke*	$x_e^*=\alpha_x/ke^*$	x_0/x_e^*
Case 1. Total	0.0317	0.0349	1.4597	1.09913	0.0885	0.0117	1.6629	0.0532	0.2194
H: capital-goods	0.0347	0.0382	1.6021	1.09913	0.0817	0.0036	1.2566	0.0650	0.0553
F: consumption-goo	0.0303	0.0333	1.3990	1.09913	0.0928	0.0157	1.9283	0.0481	0.3270
	goal seek			**goal seek**	$\alpha_x=\alpha/(1-\alpha)$				
Case 2. Total	0.0317	0.0349	1.4597	1.10047	0.0885	0.0117	1.6629	0.0532	0.2194
H: capital-goods	0.0290	0.0294	1.5989	1.10026	0.0544	0.0045	1.0143	0.0537	0.0837
F: consumption-goo	0.0327	0.0371	1.4150	1.10002	0.1102	0.0145	2.0977	0.0525	0.2759
Case 3. Total	0.0320	0.0353	1.4587	1.10069	0.0894	0.0117	1.6808	0.0532	0.2195
H: capital-goods	0.0327	0.0483	1.7733	1.10002	0.1719	0.0068	2.6520	0.0648	0.1054
F: consumption-goo	0.0320	0.0303	1.2904	1.10066	0.0693	0.0142	1.4633	0.0474	0.2989

Note: When the effective labour is used, the coefficient, x_0 and x_e, are connected with *ke* (0) (see also below).

8. Data for the Heckshher-Ohlin, Rybczynski, the Stolper-Samuelson, and Leontief paradox

$p=P_M/P_F=1$	k(0)	Δk/k(0)		*sigma*	w(0)=w(re	w(0)/r(0)	r(0)/w(0)	k/(w/r)	α_x(w/r)
Case 1. Total	7.5799	(Δ(w/r)/(w/r)			4.3645	85.68	0.0117	0.0885	7.5799
H: capital-goods	22.7102	0.0000	0.0000	#DIV/0!	16.9994	278.11	0.0036	0.0817	22.7102
F: consumption-goo	5.8963	0.0000	0.0000	#DIV/0!	2.9586	63.53	0.0157	0.0928	5.8963
							=α/(1-α)=α_x		=k(0)
Case 2. Total	7.5799				4.3645	85.68	0.0117	0.0885	7.5799
H: capital-goods	18.1682	-0.2000	0.1999	1.0003	16.9994	333.71	0.0030	0.0544	18.1682
F: consumption-goo	6.4017	0.0857	(0.0857)	1.0002	2.9586	58.08	0.0172	0.1102	6.4017
Case 3. Total	7.5799				4.3199	84.81	0.0118	0.0894	7.5799
H: capital-goods	11.9609	-0.4733	(0.7497)	-0.6313	4.4405	69.60	0.0144	0.1719	11.9609
F: consumption-goo	6.5515	0.1111	0.4872	-0.2281	4.2916	94.48	0.0106	0.0693	6.5515

Note: When the effective labour is used, the current wage rate and the profit rate are connected with *k* (0).

Rybczenski [1955] only holds under the condition of H-O.

9. Introduction of relative price level, $p=P_H/P_F$: Duality [Jones, R. W., 1965] **S-Samuelson [1941]**

$r_F=r_F(0)=\partial Y_F/\partial K_F$ $r_H(0)_{nominal}=p\cdot(\partial Y_H/\partial K_H)$, where $p=P_H/P_F$ $w_F=w_F(0)=\partial Y_F/\partial L_F$ $w_{H(0)nominal}=p\cdot(\partial Y_H/\partial L_H)$

	Marginal productivity	$r_{H(marg.pro.)}$	$r_{F(margi.Pro.)}$	$w_{H(margi.Pro.}$	$w_{F(matgi.pro.)}$	P_H	P_F	$p=P_H/P_F$	Changes (%)
Case 1.	Total	0.05094		4.3645					for r & w
	H: capital-goods	0.06112		16.9994		1		1	0.8334
	F: consumption-goods		0.04657		2.9586		1		1.0438
Case 2.	Total	0.05094		4.3645					1.0937
	H: capital-goods	**0.05094**		16.9994		1		1.0000	0.9754
	F: consumption-goods		0.05094		2.9586		1.0000		1.0000
Case 3.	Total	0.05094		4.3199					0.2612
	H: capital-goods	0.06380		4.4405		1.0000		1.0000	1.0000
	F: consumption-goods		0.04542		**4.2916**		1.0000		1.4506

T13 Case 1. Both regions have different rates of profit and the wage rates **Findlay [1960]**

Country=capital-goods+consumption-goods: T=H+F $A(0)=k(0)^{1-\alpha}/\Omega(0)$

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5652	6152	1253	953	4.0295
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08127	1.59558	0.05094	7.5799	4.7506	0.20367	0.6000	0.16285	0.04876	0.15491	4.3645
H: capital-goods		0.3	s=S/Y	0.20367	0.36	0.39		0.33		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	263.76	2944.80	126.00	54	180.00	2204.28	2384.28	413.49	287.49	7.5343
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.07549	1.23509	0.06112	11.1648	9.0397	0.17342	0.7000	0.12730	0.05285	0.12058	8.3572
F: consumption-goods			1-s	0.79633						
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1031.24	6871.20	174.00	146.00	320.00	3447.72	3767.72	839.51	665.51	3.1100
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.08493	1.82370	0.04657	6.6630	3.6536	0.22282	0.5438	0.18519	0.04618	0.17663	3.3433
Cases correspond with Hecksher-Ohlin by region.							$Y_{H(0)}/Y_{F(0)}$	0.63282		$\Omega_{H(0)}<\Omega_{F(0)}$

1. Basic variables and parameters under convergence (*delta=alpha*)

		$g_Y^*=g_K^*$	g_A^*	g_y^*	Ω^*	r^*	i	$\beta^*_{(\delta=\alpha)}$	n	α
Case 1.	Total	0.0716	0.0584	0.0636	1.5956	0.0509	0.17269	0.6617	0.00755	0.08127
H: capital-goods		0.0726	0.0597	0.0645	1.2351	0.0611	0.14931	0.6004	0.00755	0.07549
F: consumption-goo		0.0711	0.0578	0.0631	1.8237	0.0466	0.18749	0.6920	0.00755	0.08493
Case 2.	Total	0.0716	0.0584	0.0636	1.5956	0.0509	0.17269	0.6617	0.00755	0.08127
H: capital-goods		0.0656	0.0546	0.0576	1.0136	0.0509	0.12108	0.5489	0.00755	0.05163
F: consumption-goo		0.0741	0.0595	0.0661	1.9490	0.0509	0.20403	0.7082	0.00755	0.09927
Case 3.	Total	0.0719	0.0586	0.0638	1.6107	0.0509	0.17433	0.6639	0.00755	0.08204
H: capital-goods		0.1073	0.0845	0.0990	2.2986	0.0638	0.33115	0.7448	0.00755	0.14665
F: consumption-goo		0.0593	0.0480	0.0513	1.4276	0.0454	0.13258	0.6380	0.00755	0.06485

2. Basic variables and parameters under the current situation (*delta>alpha*)

		$g_{Y(a)}$	$g_{K(a)}$	$g_{A(a)}$	$g_{y(a)}$	delta	$\beta_{actual\ (\delta>\alpha)}$	$\beta^*-\beta$	$k(0)$	$y(0)$
Case 1.	Total	0.0800	0.3000	0.0487	0.0718	0.0974	0.70873	-0.0470	7.5799	4.7506
H: capital-goods		0.0400	0.4000	0.0292	0.0322	0.1065	0.78942	-0.1891	11.1648	9.0397
F: consumption-goo		0.0215	0.0989	0.0062	0.0139	0.0907	0.96648	-0.2745	6.6630	3.6536
For min capital good growth			0.0509							
Case 2.	Total	0.0800	0.3000	0.0487	0.0718	0.0974	0.70873	-0.0470	7.5799	4.7506
H: capital-goods		0.0400	0.4000	0.0122	0.0322	0.1410	0.87757	-0.3287	8.9318	8.8122
F: consumption-goo		0.0233	0.0685	0.0097	0.0156	0.0605	0.95600	-0.2478	7.2341	3.7117
Case 3.	Total	0.0800	0.3000	0.0485	0.0718	0.0960	0.71407	-0.0502	7.5799	4.7060
H: capital-goods		0.0400	0.4000	-0.0251	0.0322	-0.0186	1.05373	-0.3089	8.0266	3.4920
F: consumption-goo		0.0514	0.1431	0.0351	0.0436	0.1345	0.69572	-0.0577	7.4034	5.1859

$g_{A(a)}=g_{Y(a)}-\alpha g_{K(a)}-(1-\alpha)n$ $delta=(n+\alpha(i-i\beta^*-n))/(i(1-\beta^*))$ $\beta_{actual(\delta>\alpha)}=1-((1/i)(g_{A(a)}k(0)^\wedge(\delta-\alpha))$

3. Relationships between quantities: K_H & K_F and L_H & L_F $K=(a_{KH}\cdot y_H)L_H+(a_{KF}\cdot y_F)L_F$

Heckscher-Ohlin: $K=a_{KH}\cdot Y_H+a_{KF}\cdot Y_F$; $L=a_{LH}\cdot Y_H+a_{LF}\cdot Y_F$

For K,	$a_{KH}=\Omega_H$ $a_{KF}=\Omega_F$			y_H	$\mathbf{a_{LH}}=1/y_H$	$L=(a_{LH}\cdot y_H)L_H+(a_{LF}\cdot y_F)L_F$			
For L,	$a_{LH}=1/y_H$ $a_{LF}=1/y_F$	$a_{KH}=\Omega_H$	$a_{KF}=\Omega_F$	y_F	$\mathbf{a_{LF}}=1/y_F$	L_H & L_F	Y_H & Y_F	$K=K_H+K_F$	$L=L_H+L_F$
Case 1.	Total	1.5956		4.7506	0.21050	1295	6152	9816	1295
	H: capital-goods	1.2351		9.0397	**0.11062**	263.76	2384.28	2945	264
	F: consumption-goods		1.8237	3.6536	**0.27370**	1031.24	3767.72	6871	1031
Case 2.	Total	1.5956		4.7506	0.21050	1295	6152	9816	1295
	H: capital-goods	1.0136		8.8122	**0.11348**	263.76	2324.29	2356	264
	F: consumption-goods		1.9490	3.7117	**0.26941**	1031.24	3827.71	7460	1031
Case 3.	Total	1.6107		4.7060	0.21250	1295	6094	9816	1295
	H: capital-goods	2.2986		3.4920	**0.28637**	366.88	1281.14	2945	367
	F: consumption-goods		1.4276	5.1859	**0.19283**	928.12	4813.11	6871	928

T13 Case 2. K decreases in capital-goods by 20% **Findlay [1960]**

Country=capital-goods+consumption-goods: T=H+F							$\Delta Y(0)/Y(0)$	0.00000	$A(0)=k(0)^{1-\alpha}/\Omega(0)$	
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	$\Pi(0)$	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5652	6152	1253	953	4.0295
α	$\Omega(0)$	r(0)	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08127	1.59558	0.05094	7.5799	4.7506	0.20367	0.6000	0.16285	0.04876	0.15491	4.3645
H: capital-goods			$\Delta K/K$:	-0.2			$\Delta Y_{H(0)}/Y_{H(0)}$	-0.02516		
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	$\Pi(0)$	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	263.76	2355.84	84.00	36	**120.01**	2204.28	2324.29	330.79	246.79	7.8702
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.05163	1.01358	**0.05094**	8.9318	8.8122	0.14232	0.7000	0.11016	0.03614	0.10618	8.3572
F: consumption-goods	Using goal seek, where r_H approaches $r=r_F$						$\Delta Y_{F(0)}/Y_{F(0)}$	0.01592		
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	$\Pi(0)$	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1031.24	7460.16	216.00	164.00	379.99	3447.72	3827.71	922.21	706.21	3.0497
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.09927	1.94899	0.05094	7.2341	3.7117	0.24093	0.5684	0.19553	0.05643	0.18450	3.3433
							$Y_{H(0)}/Y_{F(0)}$	0.60723		$\Omega_{H(0)}<\Omega_{F(0)}$

4. The Penrose curve, B_K, and the assets valuation ratio, v

		Ω*	I/K	g_K*	Slope B_K	r*	r_{M*}	Slope A	Slope B_K/A	$v=1/\beta^*$
Case 1.	Total	1.5956	0.1082	0.0716	1.5113	0.0509	0.0337	1.5113	1.0000	1.5113
H: capital-goods		1.2351	0.1209	0.0726	1.6657	0.0611	0.0367	1.6657	1.0000	1.6657
F: consumption-goo		1.8237	0.1028	0.0711	1.4452	0.0466	0.0322	1.4452	1.0000	1.4452
Case 2.	Total	1.5956	0.1082	0.0716	1.5113	0.0509	0.0337	1.5113	1.0000	1.5113
H: capital-goods		1.0136	0.1195	0.0709	1.6840	0.0509	0.0302	1.6840	1.0000	1.8218
F: consumption-goo		1.9490	0.1047	0.0722	1.4509	0.0509	0.0351	1.4509	1.0000	1.4120
Case 3.	Total	1.6107	0.1082	0.0717	1.5101	0.0514	0.0341	1.5101	1.0000	1.5062
H: capital-goods		2.2986	0.1441	0.0780	1.8471	0.0638	0.0345	1.8471	1.0000	1.3426
F: consumption-goo		1.4276	0.0929	0.0698	1.3311	0.0454	0.0341	1.3311	1.0000	1.5673

5. The relative price level: real vs. nominal

					(a)	Inf. or def	(b)		(c)	
		r(0)	r=∂Yt/∂Kt	$P_Y=r(0)/r$ real	$r_{M(0)\ given}$	$p_Y=r_{M(0)}/r$ rea	r_M* at β*	(a)/(b)	r_{CB} goal see	(a)/(c)
Case 1.	Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0337	0.9791	0.0306	1.0770
H: capital-goods		0.06112	0.06112	1.0000	0.0330	0.5399	0.0367	0.8993	0.0334	0.9891
F: consumption-goo		0.04657	0.04657	1.0000	0.0330	0.7086	0.0322	1.0240	0.0293	1.1273
Case 2.	Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0337	0.9791	0.0306	1.0779
H: capital-goods		0.05094	0.05094	1.0000	0.0330	0.6478	0.0280	1.1802	0.0275	1.1999
F: consumption-goo		0.05094	0.05094	1.0000	0.0330	0.6479	0.0361	0.9148	0.0319	1.0344
Case 3.	Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0341	0.9667	0.0309	1.0670
H: capital-goods		0.06380	0.06380	1.0000	0.0330	0.5172	0.0475	0.6944	0.0314	1.0509
F: consumption-goo		0.04542	0.04542	1.0000	0.0330	0.7265	0.0290	1.1386	0.0310	1.0644

$r(real)=\partial Yt/\partial Kt=\alpha AtKt^{\alpha-1}Lt^{1-\alpha}$ and $w(real)=\partial Yt/\partial Lt=(1-\alpha)AtKt^{\alpha}Lt^{-\alpha}$

6. Relationships between price levels: r_H & w_H for P_H and r_F & w_F for P_F **Rybczynski**

For H, $P_H=a_{KH}.r_H+a_{LH}.w_H$ When real=nominal, the price level is 1.0. The elasticity of substitution is 1.0.

For F,	$P_F=a_{KF}.r_F+a_{LF}.w_F$	r_H	r_F	w_H	w_F	P_H	P_F	$p=P_H/P_F$
Case 1.	Total							
	H: capital-goods	0.06112		8.3572		1		1
	F: consumption-goods		0.04657		3.3433		1	
Case 2.	Total							
	H: capital-goods	0.05094		8.3572		1		1
	F: consumption-goods		0.05094		3.3433		1	
Case 3.	Total							
	H: capital-goods	0.06380		2.9799		1		1
	F: consumption-goods		0.04542		4.8496		1	

T13 Case 3. L decreases in consumption-goods by 10% **Uzawa [1962]**

Country=capital-goods+consumption-goods: T=H+F | $\Delta Y(0)/Y(0)$ -0.00939 | $A(0)=k(0)^{1-\alpha}/\Omega(0)$

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5594	6094	1253	953	3.9855
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08204	1.61070	0.05094	7.5799	4.7060	0.20560	0.6000	0.16447	0.04923	0.15638	4.3199

H: capital-goods | $\Delta Y_{H(0)}/Y_{H(0)}$ -0.46267

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	366.88	2944.80	131.52	56	187.88	**1093.26**	1281.14	497.44	365.93	2.5729
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.14665	2.29857	0.06380	8.0266	3.4920	0.38828	0.7000	0.31830	0.10266	0.28562	**2.9799**

F: consumption-goods | ΔL/L: -0.1 | $\Delta Y_{F(0)}/Y_{F(0)}$ 0.27746

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	$\Pi(0)$	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	928.12	6871.20	168.48	143.64	312.12	**4500.99**	4813.11	755.56	587.08	4.5545
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.06485	1.42760	0.04542	7.4034	5.1859	0.15698	0.5398	0.12640	0.03501	0.12197	**4.8496**

$Y_{H(0)}/Y_{F(0)}$ 0.26618 **$\Omega_{H(0)}>\Omega_{F(0)}$**

7. The neutrality of financial assets and the coeffcient *x=r/w*

$ke*=\Omega*\hat{}(1/(1-\alpha))$ $x_e*/x_0=k(0)/ke*$

	r_{CB} goal see	r_M* at $\beta*$	$r*/r_{M*}$	$c_{CB}=r_M*/r_{CB}$	α_x	$x_0=\alpha_x/k(0$	ke*	$x_e^*=\alpha_x/ke^*$	x_0/x_e^*
Case 1. Total	0.0306	0.0337	1.5113	1.09997	0.0885	0.0117	1.6629	0.0532	0.2194
H: capital-goods	0.0334	0.0367	1.6657	1.09996	0.0817	0.0073	1.2566	0.0650	0.1125
F: consumption-goo	0.0293	0.0322	1.4452	1.10087	0.0928	0.0139	1.9283	0.0481	0.2894
	goal seek			**goal seek**	$\alpha_x=\alpha/(1-\alpha)$				
Case 2. Total	0.0306	0.0337	1.5113	1.10094	0.0885	0.0117	1.6629	0.0532	0.2194
H: capital-goods	0.0275	0.0280	1.6840	1.09989	0.0544	0.0091	1.0143	0.0537	0.1703
F: consumption-goo	0.0319	0.0361	1.4509	1.10042	0.1102	0.0128	2.0977	0.0525	0.2442
Case 3. Total	0.0309	0.0341	1.5101	1.10092	0.0894	0.0117	1.6808	0.0532	0.2195
H: capital-goods	0.0314	0.0475	1.8471	1.09996	0.1719	0.0102	2.6520	0.0648	0.1570
F: consumption-goo	0.0310	0.0290	1.3311	1.10070	0.0693	0.0125	1.4633	0.0474	0.2645

Note: When the effective labour is used, the coefficient, x_0 and x_e, are connected with *ke* (0) (see also below).

8. Data for the Heckser-Ohlin, Rybczynski, the Stolper-Samuelson, and Leontief paradox

$p=P_M/P_F=1$	k(0)	Δk/k(0)		*sigma*	w(0)=w(rea	w(0)/r(0)	r(0)/w(0)	k/(w/r)	α_x(w/r)
Case 1. Total	7.5799		(Δ(w/r)/(w/r)		4.3645	85.68	0.0117	0.0885	7.5799
H: capital-goods	11.1648	0.0000	0.0000	#DIV/0!	8.3572	136.72	0.0073	0.0817	11.1648
F: consumption-goo	6.6630	0.0000	0.0000	#DIV/0!	3.3433	71.79	0.0139	0.0928	6.6630
								$=\alpha/(1-\alpha)=\alpha_x$	=k(0)
Case 2. Total	7.5799				4.3645	85.68	0.0117	0.0885	7.5799
H: capital-goods	8.9318	-0.2000	0.1999	1.0003	8.3572	164.06	0.0061	0.0544	8.9318
F: consumption-goo	7.2341	0.0857	(0.0857)	1.0002	3.3433	65.64	0.0152	0.1102	7.2341
Case 3. Total	7.5799				4.3199	84.81	0.0118	0.0894	7.5799
H: capital-goods	8.0266	-0.2811	(0.6584)	-0.4269	2.9799	46.71	0.0214	0.1719	8.0266
F: consumption-goo	7.4034	0.1111	0.4872	-0.2281	4.8496	106.76	0.0094	0.0693	7.4034

Rybczenski [1955] only holds under the condition of H-O.

9. Introduction of relative price level, $p=P_H/P_F$: Duality [Jones, R. W., 1965] S-Samuelson [1941]

$r_F=r_F(0)=\partial Y_F/\partial K_F$ $r_H(0)_{nominal}=p\cdot(\partial Y_H/\partial K_H)$, where $p=P_H/P_F$ $w_F=w_F(0)=\partial Y_F/\partial L_F$ $w_{H(0)nominal}=p\cdot(\partial Y_H/\partial L_H)$

	Marginal productivity	$r_{H(marg.pro.)}$	$r_{F(margi.Pro.)}$	$w_{H(margi.Pro.)}$	$w_{F(matgi.pro.)}$	P_H	P_F	$p=P_H/P_F$	Changes (%)
Case 1.	Total	0.05094		4.3645					for r & w
	H: capital-goods	0.06112		8.3572		1		1	0.8334
	F: consumption-goods		0.04657		3.3433		1		1.0438
Case 2.	Total	0.05094		4.3645					1.0937
	H: capital-goods	**0.05094**		8.3572		1		1.0000	0.9754
	F: consumption-goods		0.05094		3.3433		1.0000		1.0000
Case 3.	Total	0.05094		4.3199					0.3566
	H: capital-goods	0.06380		2.9799		1.0000		1.0000	1.0000
	F: consumption-goods		0.04542		**4.8496**		1.0000		1.4506

T14 Case 1. Both regions have different rates of profit and the wage rates **Findlay [1960]**

Country=capital-goods+consumption-goods: T=H+F $A(0)=k(0)^{1-\alpha}/\Omega(0)$

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5652	6152	1850	1550	4.0295
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08127	1.59558	0.05094	7.5799	4.7506	0.30072	0.6000	0.26487	0.04876	0.25195	4.3645
H: capital-goods		0.3	s=S/Y	0.30072	0.36	0.39		0.33		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	389.43	2944.80	126.00	54	180.00	2204.28	2384.28	610.50	484.50	5.2553
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.07549	1.23509	0.06112	7.5619	6.1225	0.25605	0.7000	0.21454	0.05285	0.20321	5.6603
F: consumption-goods			1-s	0.69928						
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	905.57	6871.20	174.00	146.00	320.00	3447.72	3767.72	1239.50	1065.50	3.5027
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.08493	1.82370	0.04657	7.5877	4.1606	0.32898	0.5438	0.29649	0.04618	0.28280	3.8072

Cases correspond with Hecksher-Ohlin by region. $Y_{H(0)}/Y_{F(0)}$ 0.63282 $\Omega_{H(0)}<\Omega_{F(0)}$

1. Basic variables and parameters under convergence (*delta=alpha*)

		$g_Y{}^*=g_K{}^*$	$g_A{}^*$	$g_y{}^*$	Ω^*	r^*	i	$\beta^*{}_{(\delta=\alpha)}$	n	α
Case 1.	Total	0.1026	0.0867	0.0943	1.5956	0.0509	0.25033	0.6538	0.00755	0.08127
H: capital-goods		0.1033	0.0878	0.0950	1.2351	0.0611	0.21541	0.5922	0.00755	0.07549
F: consumption-goo		0.1022	0.0860	0.0940	1.8237	0.0466	0.27242	0.6844	0.00755	0.08493
Case 2.	Total	0.1026	0.0867	0.0943	1.5956	0.0509	0.25033	0.6538	0.00755	0.08127
H: capital-goods		0.0933	0.0807	0.0851	1.0136	0.0509	0.17533	0.5395	0.00755	0.05163
F: consumption-goo		0.1064	0.0884	0.0982	1.9490	0.0509	0.29586	0.7012	0.00755	0.09927
Case 3.	Total	0.1029	0.0869	0.0947	1.6107	0.0509	0.25270	0.6561	0.00755	0.08204
H: capital-goods		0.1544	0.1243	0.1457	2.2986	0.0638	0.47915	0.7405	0.00755	0.14665
F: consumption-goo		0.0847	0.0716	0.0765	1.4276	0.0454	0.19242	0.6281	0.00755	0.06485

2. Basic variables and parameters under the current situation (*delta>alpha*)

		$g_{Y(a)}$	$g_{K(a)}$	$g_{A(a)}$	$g_{y(a)}$	delta	$\beta_{actual\ (\delta>\alpha)}$	$\beta^*-\beta$	$k(0)$	$y(0)$
Case 1.	Total	0.0800	0.3000	0.0487	0.0718	0.0921	0.80119	-0.1474	7.5799	4.7506
H: capital-goods		0.0400	0.4000	0.0292	0.0322	0.0965	0.85866	-0.2665	7.5619	6.1225
F: consumption-goo		0.0425	0.0970	0.0274	0.0347	0.0888	0.89867	-0.2143	7.5877	4.1606
For min capital good growth			0.0509							
Case 2.	Total	0.0800	0.3000	0.0487	0.0718	0.0921	0.80119	-0.1474	7.5799	4.7506
H: capital-goods		0.0400	0.4000	0.0122	0.0322	0.1121	0.92248	-0.3830	6.0495	5.9685
F: consumption-goo		0.0432	0.0813	0.0283	0.0354	0.0732	0.90947	-0.2083	8.2380	4.2268
Case 3.	Total	0.0800	0.3000	0.0485	0.0718	0.0914	0.80455	-0.1485	7.5799	4.7060
H: capital-goods		0.0400	0.4000	-0.0251	0.0322	0.0344	1.04273	-0.3022	6.1352	2.6691
F: consumption-goo		0.0506	0.1199	0.0358	0.0427	0.1115	0.79471	-0.1666	8.4308	5.9055

$g_{A(a)}=g_{Y(a)}-\alpha g_{K(a)}-(1-\alpha)n$ delta=(n+α(i-iβ*-n))/(i(1-β*)) $\beta_{actual(\delta>\alpha)}=1-((1/i)(g_{A(a)}k(0)\wedge(\delta-\alpha))$

Heckscher-Ohlin

3. Relationships between quantities: K_H & K_F and L_H & L_F

$K=(a_{KH}\cdot y_H)L_H+(a_{KF}\cdot y_F)L_F$ $L=(a_{LH}\cdot y_H)L_H+(a_{LF}\cdot y_F)L_F$

$K=a_{KH}\cdot Y_H+a_{KF}\cdot Y_F$ $L=a_{LH}\cdot Y_H+a_{LF}\cdot Y_F$

For K, $a_{KH}=\Omega_H$ $a_{KF}=\Omega_F$ y_H $\mathbf{a_{LH}}=1/y_H$

For L, $a_{LH}=1/y_H$ $a_{LF}=1/y_F$ y_F $\mathbf{a_{LF}}=1/y_F$

		$a_{KH}=\Omega_H$	$a_{KF}=\Omega_F$	y_H / y_F	a_{LH} / a_{LF}	L_H & L_F	Y_H & Y_F	$K=K_H+K_F$	$L=L_H+L_F$
Case 1.	Total	1.5956		4.7506	0.21050	1295	6152	9816	1295
	H: capital-goods	1.2351		6.1225	**0.16333**	389.43	2384.28	2945	389
	F: consumption-goods		1.8237	4.1606	**0.24035**	905.57	3767.72	6871	906
Case 2.	Total	1.5956		4.7506	0.21050	1295	6152	9816	1295
	H: capital-goods	1.0136		5.9685	**0.16755**	389.43	2324.29	2356	389
	F: consumption-goods		1.9490	4.2268	**0.23658**	905.57	3827.71	7460	906
Case 3.	Total	1.6107		4.7060	0.21250	1295	6094	9816	1295
	H: capital-goods	2.2986		2.6691	**0.37465**	479.98	1281.14	2945	480
	F: consumption-goods		1.4276	5.9055	**0.16933**	815.02	4813.11	6871	815

T14 Case 2. K decreases in capital-goods by 20% **Findlay [1960]**

Country=capital-goods+consumption-goods: T=H+F							$\Delta Y(0)/Y(0)$	0.00000	$A(0)=k(0)^{1-\alpha}/\Omega(0)$	
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5652	6152	1850	1550	4.0295
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08127	1.59558	0.05094	7.5799	4.7506	0.30072	0.6000	0.26487	0.04876	0.25195	4.3645
H: capital-goods			ΔK/K:	-0.2			$\Delta Y_{H(0)}/Y_{H(0)}$	-0.02516		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	389.43	2355.84	84.00	36	**120.01**	2204.28	2324.29	488.40	404.40	5.4388
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.05163	1.01358	**0.05094**	6.0495	5.9685	0.21013	0.7000	0.18051	0.03614	0.17399	5.6603
F: consumption-goods	Using goal seek, where r_H approaches $r=r_F$						$\Delta Y_{F(0)}/Y_{F(0)}$	0.01592		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	905.57	7460.16	216.00	164.00	379.99	3447.72	3827.71	1361.60	1145.60	3.4284
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.09927	1.94899	0.05094	8.2380	4.2268	0.35572	0.5684	0.31719	0.05643	0.29929	3.8072
							$Y_{H(0)}/Y_{F(0)}$	0.60723		$\Omega_{H(0)}<\Omega_{F(0)}$

4. The Penrose curve, B_K, and the assets valuation ratio, v

	Ω^*	I/K	$g_K{}^*$	Slope B_K	r^*	r_{M^*}	Slope A	Slope B_K/A	$v=1/\beta^*$
Case 1. Total	1.5956	0.1569	0.1026	1.5294	0.0509	0.0333	1.5294	1.0000	1.5294
H: capital-goods	1.2351	0.1744	0.1033	1.6886	0.0611	0.0362	1.6886	1.0000	1.6886
F: consumption-goo	1.8237	0.1494	0.1022	1.4612	0.0466	0.0319	1.4612	1.0000	1.4612
Case 2. Total	1.5956	0.1569	0.1026	1.5294	0.0509	0.0333	1.5294	1.0000	1.5294
H: capital-goods	1.0136	0.1730	0.1009	1.7148	0.0509	0.0297	1.7148	1.0000	1.8536
F: consumption-goo	1.9490	0.1518	0.1037	1.4634	0.0509	0.0348	1.4634	1.0000	1.4262
Case 3. Total	1.6107	0.1569	0.1027	1.5282	0.0514	0.0336	1.5282	1.0000	1.5242
H: capital-goods	2.2986	0.2085	0.1113	1.8735	0.0638	0.0341	1.8735	1.0000	1.3505
F: consumption-goo	1.4276	0.1348	0.1002	1.3453	0.0454	0.0338	1.3453	1.0000	1.5922

5. The relative price level: real vs. nominal

				(a)	Inf. or def	(b)		(c)	
	$r(0)$	$r=\partial Yt/\partial Kt$	$P_Y=r(0)/r_{real}$	$r_{M(0)\ given}$	$p_Y=r_{M(0)}/r_{rea}$	$r_M{}^*$ at β^*	(a)/(b)	r_{CB} goal see	(a)/(c)
Case 1. Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0333	0.9909	0.0303	1.0899
H: capital-goods	0.06112	0.06112	1.0000	0.0330	0.5399	0.0362	0.9117	0.0329	1.0027
F: consumption-goo	0.04657	0.04657	1.0000	0.0330	0.7086	0.0319	1.0354	0.0290	1.1389
Case 2. Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0333	0.9909	0.0303	1.0899
H: capital-goods	0.05094	0.05094	1.0000	0.0330	0.6478	0.0275	1.2008	0.0270	1.2217
F: consumption-goo	0.05094	0.05094	1.0000	0.0330	0.6479	0.0357	0.9240	0.0316	1.0437
Case 3. Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0337	0.9782	0.0306	1.0788
H: capital-goods	0.06380	0.06380	1.0000	0.0330	0.5172	0.0472	0.6985	0.0310	1.0658
F: consumption-goo	0.04542	0.04542	1.0000	0.0330	0.7265	0.0285	1.1567	0.0307	1.0750

Note: If the price level of output, P_Y, is one, real=nominal and the elasticity of substitution, σ, is always 1.0.

$r(real)=\partial Yt/\partial Kt=\alpha AtKt^{\wedge\alpha-1}Lt^{1-\alpha}$ and $w(real)=\partial Yt/\partial Lt=(1-\alpha)AtKt^{\alpha}Lt^{-\alpha}$

6. Relationships between price levels: r_H & w_H for P_H and r_F & w_F for P_F **Rybczynski**

For H, $P_H=a_{KH}.r_H+a_{LH}.w_H$ When real=nominal, the price level is 1.0. The elasticity of substitution is 1.0.

For F, $P_F=a_{KF}.r_F+a_{LF}.w_F$

		r_H	r_F	w_H	w_F	P_H	P_F	$p=P_H/P_F$
Case 1.	Total							
	H: capital-goods	0.06112		5.6603		1		1
	F: consumption-goods		0.04657		3.8072		1	
Case 2.	Total							
	H: capital-goods	0.05094		5.6603		1		1
	F: consumption-goods		0.05094		3.8072		1	
Case 3.	Total							
	H: capital-goods	0.06380		2.2777		1		1
	F: consumption-goods		0.04542		5.5226		1	

T14 Case 3. L decreases in consumption-goods by 10% **Uzawa [1962]**

Country=capital-goods+consumption-goods: T=H+F							ΔY(0)/Y(0)	-0.00939		A(0)=k(0)^(1−α)/Ω(0)
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5594	6094	1850	1550	3.9855
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08204	1.61070	0.05094	7.5799	4.7060	0.30356	0.6000	0.26751	0.04923	0.25434	4.3199
H: capital-goods							$\Delta Y_{H(0)}/Y_{H(0)}$	-0.46267		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	479.98	2944.80	131.52	56	187.88	**1093.26**	1281.14	734.45	602.93	2.0457
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.14665	2.29857	0.06380	6.1352	2.6691	0.57328	0.7000	0.52446	0.10266	0.47062	**2.2777**
F: consumption-goods			ΔL/L:	-0.1			$\Delta Y_{F(0)}/Y_{F(0)}$	0.27746		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	815.02	6871.20	168.48	143.64	312.12	**4500.99**	4813.11	1115.55	947.07	5.1430
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.06485	1.42760	0.04542	8.4308	5.9055	0.23177	0.5398	0.20391	0.03501	0.19677	**5.5226**
							$Y_{H(0)}/Y_{F(0)}$	0.26618		$\Omega_{H(0)}>\Omega_{F(0)}$

7. The neutrality of financial assets and the coeffcient *x=r/w*

ke*=Ω*^(1/(1−α)) $x_e^*/x_0=k(0)/ke^*$

	r_{CB} goal see	r_M^* at β^*	r^*/r_{M^*}	$c_{CB}=r_M^*/r_{CB}$	α_x	$x_0=\alpha_x/k(0$	ke*	$x_e^*=\alpha_x/ke^*$	x_0/x_e^*
Case 1. Total	0.0303	0.0333	1.5294	1.09992	0.0885	0.0117	1.6629	0.0532	0.2194
H: capital-goods	0.0329	0.0362	1.6886	1.09988	0.0817	0.0108	1.2566	0.0650	0.1662
F: consumption-goo	0.0290	0.0319	1.4612	1.09994	0.0928	0.0122	1.9283	0.0481	0.2541
	goal seek			**goal seek**	$\alpha_x=\alpha/(1-\alpha)$				
Case 2. Total	0.0303	0.0333	1.5294	1.09993	0.0885	0.0117	1.6629	0.0532	0.2194
H: capital-goods	0.0270	0.0275	1.7148	1.09970	0.0544	0.0135	1.0143	0.0537	0.2515
F: consumption-goo	0.0316	0.0357	1.4634	1.10090	0.1102	0.0113	2.0977	0.0525	0.2144
Case 3. Total	0.0306	0.0337	1.5282	1.09993	0.0894	0.0117	1.6808	0.0532	0.2195
H: capital-goods	0.0310	0.0472	1.8735	1.09987	0.1719	0.0133	2.6520	0.0648	0.2054
F: consumption-goo	0.0307	0.0285	1.3453	1.09995	0.0693	0.0110	1.4633	0.0474	0.2323

Note: When the effective labour is used, the coefficient, x_0 and x_e, are connected with *ke* (0) (see also below).

8. Data for the Hecksher-Ohlin, Rybczynski, the Stolper-Samuelson, and Leontief paradox

$p=P_M/P_F=1$	k(0)	Δk/k(0)		*sigma*	w(0)=w(re	w(0)/r(0)	r(0)/w(0)	k/(w/r)	α_x(w/r)
Case 1. Total	7.5799	(Δ(w/r)/(w/r)			4.3645	85.68	0.0117	0.0885	7.5799
H: capital-goods	7.5619	0.0000	0.0000	#DIV/0!	5.6603	92.60	0.0108	0.0817	7.5619
F: consumption-goo	7.5877	0.0000	0.0000	#DIV/0!	3.8072	81.75	0.0122	0.0928	7.5877
							=α/(1-α)=α_x		=k(0)
Case 2. Total	7.5799				4.3645	85.68	0.0117	0.0885	7.5799
H: capital-goods	6.0495	-0.2000	0.1999	1.0003	5.6603	111.12	0.0090	0.0544	6.0495
F: consumption-goo	8.2380	0.0857	(0.0857)	1.0002	3.8072	74.74	0.0134	0.1102	8.2380
Case 3. Total	7.5799				4.3199	84.81	0.0118	0.0894	7.5799
H: capital-goods	6.1352	-0.1887	(0.6145)	-0.3070	2.2777	35.70	0.0280	0.1719	6.1352
F: consumption-goo	8.4308	0.1111	0.4872	-0.2281	5.5226	121.58	0.0082	0.0693	8.4308

Note: When the effective labour is used, the current wage rate and the profit rate are connected with *k* (0).

Rybczenski [1955] only holds under the condition of H-O.

9. Introduction of relative price level, $p=P_H/P_F$: Duality [Jones, R. W., 1965] S-Samuelson [1941]

$r_F=r_F(0)=\partial Y_F/\partial K_F$ $r_H(0)_{nominal}=p\cdot(\partial Y_H/\partial K_H)$, where $p=P_H/P_F$ $w_F=w_F(0)=\partial Y_F/\partial L_F$ $w_{H(0)nominal}=p\cdot(\partial Y_H/\partial L_H)$

	Marginal productivity	$r_{H(marg.pro.)}$	$r_{F(margi.Pro.)}$	$w_{H(margi.Pro.}$	$w_{F(matgi.pro.)}$	P_H	P_F	$p=P_H/P_F$	Changes (%) for r & w
Case 1.	Total	0.05094		4.3645					
	H: capital-goods	0.06112		5.6603		1		1	0.8334
	F: consumption-goods		0.04657		3.8072		1		1.0438
Case 2.	Total	0.05094		4.3645					1.0937
	H: capital-goods	**0.05094**		5.6603		1		1.0000	0.9754
	F: consumption-goods		0.05094		3.8072		1.0000		1.0000
Case 3.	Total	0.05094		4.3199					0.4024
	H: capital-goods	0.06380		2.2777		1.0000		1.0000	1.0000
	F: consumption-goods		0.04542		**5.5226**		1.0000		1.4506

T15 Case 1. Both regions have different rates of profit and the wage rates **Findlay [1960]**

Country=capital-goods+consumption-goods: T=H+F $A(0)=k(0)^{1-\alpha}/\Omega(0)$

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5652	6152	2500	2200	4.0295
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08127	1.59558	0.05094	7.5799	4.7506	0.40637	0.6000	0.37594	0.04876	0.35761	4.3645
H: capital-goods		0.3	s=S/Y	0.40637	0.36	0.39		0.33		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	526.25	2944.80	126.00	54	180.00	2204.28	2384.28	825.00	699.00	3.9784
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.07549	1.23509	0.06112	5.5958	4.5307	0.34602	0.7000	0.30953	0.05285	0.29317	4.1886
F: consumption-goods			1-s	0.59363						
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	768.75	6871.20	174.00	146.00	320.00	3447.72	3767.72	1675.00	1501.00	4.0691
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.08493	1.82370	0.04657	8.9382	4.9011	0.44457	0.5438	0.41767	0.04618	0.39838	4.4848

Cases correspond with Hecksher-Ohlin by region. $Y_{H(0)}/Y_{F(0)}$ 0.63282 $\Omega_{H(0)} < \Omega_{F(0)}$

1. Basic variables and parameters under convergence (*delta=alpha*)

	$g_Y^*=g_K^*$	g_A^*	g_y^*	Ω^*	r^*	i	$\beta^*_{(\delta=\alpha)}$	n	α
Case 1. Total	0.1363	0.1174	0.1278	1.5956	0.0509	0.33485	0.6494	0.00755	0.08127
H: capital-goods	0.1367	0.1185	0.1282	1.2351	0.0611	0.28738	0.5876	0.00755	0.07549
F: consumption-goo	0.1361	0.1167	0.1276	1.8237	0.0466	0.36489	0.6801	0.00755	0.08493
Case 2. Total	0.1363	0.1174	0.1278	1.5956	0.0509	0.33485	0.6494	0.00755	0.08127
H: capital-goods	0.1235	0.1092	0.1151	1.0136	0.0509	0.23439	0.5342	0.00755	0.05163
F: consumption-goo	0.1416	0.1199	0.1331	1.9490	0.0509	0.39585	0.6972	0.00755	0.09927
Case 3. Total	0.1368	0.1177	0.1283	1.6107	0.0509	0.33802	0.6517	0.00755	0.08204
H: capital-goods	0.2056	0.1677	0.1966	2.2986	0.0638	0.64029	0.7380	0.00755	0.14665
F: consumption-goo	0.1123	0.0972	0.1040	1.4276	0.0454	0.25757	0.6225	0.00755	0.06485

2. Basic variables and parameters under the current situation (*delta>alpha*)

	$g_{Y(a)}$	$g_{K(a)}$	$g_{A(a)}$	$g_{y(a)}$	delta	$\beta_{actual\ (\delta>\alpha)}$	$\beta^*-\beta$	$k(0)$	$y(0)$
Case 1. Total	0.0800	0.3000	0.0487	0.0718	0.0893	0.85223	-0.2028	7.5799	4.7506
H: capital-goods	0.0400	0.4000	0.0292	0.0322	0.0911	0.89571	-0.3081	5.5958	4.5307
F: consumption-goo	0.0478	0.0960	0.0327	0.0399	0.0878	0.90979	-0.2297	8.9382	4.9011
For min capital good growth		0.0509							
Case 2. Total	0.0800	0.3000	0.0487	0.0718	0.0893	0.85223	-0.2028	7.5799	4.7506
H: capital-goods	0.0400	0.4000	0.0122	0.0322	0.0963	0.94439	-0.4102	4.4766	4.4167
F: consumption-goo	0.0479	0.0882	0.0323	0.0400	0.0800	0.92182	-0.2246	9.7043	4.9792
Case 3. Total	0.0800	0.3000	0.0485	0.0718	0.0890	0.85461	-0.2029	7.5799	4.7060
H: capital-goods	0.0400	0.4000	-0.0251	0.0322	0.0634	1.03436	-0.2963	4.8826	2.1242
F: consumption-goo	0.0466	0.1075	0.0326	0.0388	0.0992	0.86305	-0.2406	9.9313	6.9566

$g_{A(a)}=g_{Y(a)}-\alpha g_{K(a)}-(1-\alpha)n$ delta=(n+α(i-iβ*-n))/(i(1-β*)) $\beta_{actual(\delta>\alpha)}=1-((1/i)(g_{A(a)}k(0)^{\wedge}(\delta-\alpha))$

Heckscher-Ohlin

3. Relationships between quantities: K_H & K_F and L_H & L_F $K=(a_{KH}\cdot y_H)L_H+(a_{KF}\cdot y_F)L_F$ $L=(a_{LH}\cdot y_H)L_H+(a_{LF}\cdot y_F)L_F$ $K=a_{KH}\cdot Y_H+a_{KF}\cdot Y_F$ $L=a_{LH}\cdot Y_H+a_{LF}\cdot Y_F$

For K, $a_{KH}=\Omega_H$ $a_{KF}=\Omega_F$

For L, $a_{LH}=1/y_H$ $a_{LF}=1/y_F$

		$a_{KH}=\Omega_H$	$a_{KF}=\Omega_F$	y_H / y_F	$a_{LH}=1/y_H$ / $a_{LF}=1/y_F$	L_H & L_F	Y_H & Y_F	$K=K_H+K_F$	$L=L_H+L_F$
Case 1.	Total	1.5956		4.7506	0.21050	1295	6152	9816	1295
	H: capital-goods	1.2351		4.5307	**0.22072**	526.25	2384.28	2945	526
	F: consumption-goods		1.8237	4.9011	**0.20404**	768.75	3767.72	6871	769
Case 2.	Total	1.5956		4.7506	0.21050	1295	6152	9816	1295
	H: capital-goods	1.0136		4.4167	**0.22641**	526.25	2324.29	2356	526
	F: consumption-goods		1.9490	4.9792	**0.20084**	768.75	3827.71	7460	769
Case 3.	Total	1.6107		4.7060	0.21250	1295	6094	9816	1295
	H: capital-goods	2.2986		2.1242	**0.47077**	603.13	1281.14	2945	603
	F: consumption-goods		1.4276	6.9566	**0.14375**	691.87	4813.11	6871	692

T15 Case 2. K decreases in capital-goods by 20% **Findlay [1960]**

Country=capital-goods+consumption-goods: T=H+F							ΔY(0)/Y(0)	0.00000	A(0)=k(0)^{1−α}/Ω(0)	
n	L(0)	K(0)	$S_Π(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5652	6152	2500	2200	4.0295
α	Ω(0)	r(0)	k(0)	y(0)	s	$s_Π$	s_H	$s_{SΠ/Y}$	$s_{SH/Y}$	w(0)
0.08127	1.59558	0.05094	7.5799	4.7506	0.40637	0.6000	0.37594	0.04876	0.35761	4.3645
H: capital-goods			ΔK/K:	-0.2			$ΔY_{H(0)}/Y_{H(0)}$	-0.02516		
n	L(0)	K(0)	$S_Π(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	526.25	2355.84	84.00	36	**120.01**	2204.28	2324.29	660.00	576.00	4.0878
α	$Ω_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	$s_Π$	s_H	$s_{SΠ/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.05163	1.01358	**0.05094**	4.4766	4.4167	0.28396	0.7000	0.25711	0.03614	0.24782	4.1886
F: consumption-goods	Using goal seek, where r_H approaches $r=r_F$						$ΔY_{F(0)}/Y_{F(0)}$	0.01592		
n	L(0)	K(0)	$S_Π(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	768.75	7460.16	216.00	164.00	379.99	3447.72	3827.71	1840.00	1624.00	3.9735
α	$Ω_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	$s_Π$	s_H	$s_{SΠ/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.09927	1.94899	0.05094	9.7043	4.9792	0.48070	0.5684	0.44965	0.05643	0.42428	4.4848
							$Y_{H(0)}/Y_{F(0)}$	0.60723		$Ω_{H(0)}<Ω_{F(0)}$

4. The Penrose curve, B_K, and the assets valuation ratio, v

	$Ω*$	I/K	g_K*	Slope B_K	$r*$	r_{M*}	Slope A	Slope B_K/A	$v=1/β^*$
Case 1. Total	1.5956	0.2099	0.1363	1.5398	0.0509	0.0331	1.5398	1.0000	1.5398
H: capital-goods	1.2351	0.2327	0.1367	1.7019	0.0611	0.0359	1.7019	1.0000	1.7019
F: consumption-goo	1.8237	0.2001	0.1361	1.4704	0.0466	0.0317	1.4704	1.0000	1.4704
Case 2. Total	1.5956	0.2099	0.1363	1.5398	0.0509	0.0331	1.5398	1.0000	1.5398
H: capital-goods	1.0136	0.2313	0.1335	1.7327	0.0509	0.0294	1.7327	1.0000	1.8719
F: consumption-goo	1.9490	0.2031	0.1381	1.4705	0.0509	0.0346	1.4705	1.0000	1.4342
Case 3. Total	1.6107	0.2099	0.1364	1.5386	0.0514	0.0334	1.5386	1.0000	1.5344
H: capital-goods	2.2986	0.2786	0.1475	1.8887	0.0638	0.0338	1.8887	1.0000	1.3549
F: consumption-goo	1.4276	0.1804	0.1333	1.3533	0.0454	0.0336	1.3533	1.0000	1.6065

5. The relative price level: real vs. nominal

				(a)	Inf. or def	(b)		(c)	
	$r(0)$	r=∂Yt/∂Kt	$P_Y=r(0)/r_{real}$	$r_{M(0)\ given}$	$p_Y=r_{M(0)}/r_{rea}$	r_M* at $β*$	(a)/(b)	r_{CB} goal see	(a)/(c)
Case 1. Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0331	0.9976	0.0301	1.0972
H: capital-goods	0.06112	0.06112	1.0000	0.0330	0.5399	0.0359	0.9188	0.0327	1.0105
F: consumption-goo	0.04657	0.04657	1.0000	0.0330	0.7086	0.0317	1.0419	0.0288	1.1460
Case 2. Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0331	0.9976	0.0301	1.0972
H: capital-goods	0.05094	0.05094	1.0000	0.0330	0.6478	0.0272	1.2127	0.0267	1.2342
F: consumption-goo	0.05094	0.05094	1.0000	0.0330	0.6479	0.0355	0.9292	0.0315	1.0479
Case 3. Total	0.05094	0.05094	1.0000	0.0330	0.6479	0.0335	0.9848	0.0304	1.0861
H: capital-goods	0.06380	0.06380	1.0000	0.0330	0.5172	0.0471	0.7008	0.0307	1.0744
F: consumption-goo	0.04542	0.04542	1.0000	0.0330	0.7265	0.0283	1.1671	0.0305	1.0814

Note: If the price level of output, P_Y, is one, real=nominal and the elasticity of substitution, $σ$, is always 1.0.

r(real)=∂Yt/∂Kt=αAtKt^{α-1}Lt^{1-α} and w(real)=∂Yt/∂Lt=(1-α)AtKt^{α}Lt^{-α}

6. Relationships between price levels: r_H & w_H for P_H and r_F & w_F for P_F **Rybczynski**

For H, $P_H=a_{KH}.r_H+a_{LH}.w_H$ When real=nominal, the price level is 1.0. The elasticity of substitution is 1.0.

For F, $P_F=a_{KF}.r_F+a_{LF}.w_F$

		r_H	r_F	w_H	w_F	P_H	P_F	$p=P_H/P_F$
Case 1.	Total							
	H: capital-goods	0.06112		4.1886		1		1
	F: consumption-goods		0.04657		4.4848		1	
Case 2.	Total							
	H: capital-goods	0.05094		4.1886		1		1
	F: consumption-goods		0.05094		4.4848		1	
Case 3.	Total							
	H: capital-goods	0.06380		1.8127		1		1
	F: consumption-goods		0.04542		6.5055		1	

T15 Case 3. L decreases in consumption-goods by 10% **Uzawa [1962]**

Country=capital-goods+consumption-goods: T=H+F							ΔY(0)/Y(0)	-0.00939	$A(0)=k(0)^{1-\alpha}/\Omega(0)$	
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	300	200	500	5594	6094	2500	2200	3.9855
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08204	1.61070	0.05094	7.5799	4.7060	0.41022	0.6000	0.37969	0.04923	0.36100	4.3199
H: capital-goods							$\Delta Y_{H(0)}/Y_{H(0)}$	-0.46267		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	603.13	2944.80	131.52	56	187.88	**1093.26**	1281.14	992.50	860.98	1.6834
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.14665	2.29857	0.06380	4.8826	2.1242	0.77470	0.7000	0.74892	0.10266	0.67204	**1.8127**
F: consumption-goods			ΔL/L:	-0.1			$\Delta Y_{F(0)}/Y_{F(0)}$	0.27746		
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	691.87	6871.20	168.48	143.64	312.12	**4500.99**	4813.11	1507.50	1339.02	5.9944
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.06485	1.42760	0.04542	9.9313	6.9566	0.31321	0.5398	0.28829	0.03501	0.27820	**6.5055**
							$Y_{H(0)}/Y_{F(0)}$	0.26618		$\mathbf{\Omega_{H(0)}>\Omega_{F(0)}}$

7. The neutrality of financial assets and the coeffcient *x=r/w*

ke*=Ω*^(1/(1−α)) $x_e^*/x_0=k(0)/ke^*$

	r_{CB} goal see	r_M* at β*	r^*/r_{M^*}	$c_{CB}=r_M^*/r_{CB}$	α_x	$x_0=\alpha_x/k(0$	ke*	$x_e^*=\alpha_x/ke^*$	x_0/x_e^*
Case 1. Total	0.0301	0.0331	1.5398	1.09987	0.0885	0.0117	1.6629	0.0532	0.2194
H: capital-goods	0.0327	0.0359	1.7019	1.09981	0.0817	0.0146	1.2566	0.0650	0.2246
F: consumption-goo	0.0288	0.0317	1.4704	1.09990	0.0928	0.0104	1.9283	0.0481	0.2157
	goal seek			**goal seek**	$\alpha_x=\alpha/(1-\alpha)$				
Case 2. Total	0.0301	0.0331	1.5398	1.09988	0.0885	0.0117	1.6629	0.0532	0.2194
H: capital-goods	0.0267	0.0272	1.7327	1.09952	0.0544	0.0182	1.0143	0.0537	0.3399
F: consumption-goo	0.0315	0.0355	1.4705	1.09996	0.1102	0.0096	2.0977	0.0525	0.1820
Case 3. Total	0.0304	0.0335	1.5386	1.09989	0.0894	0.0117	1.6808	0.0532	0.2195
H: capital-goods	0.0307	0.0471	1.8887	1.09979	0.1719	0.0167	2.6520	0.0648	0.2581
F: consumption-goo	0.0305	0.0283	1.3533	1.09992	0.0693	0.0093	1.4633	0.0474	0.1972

Note: When the effective labour is used, the coefficient, x_0 and x_e, are connected with *ke* (0) (see also below).

8. Data for the Heckser-Ohlin, Rybczynski, the Stolper-Samuelson, and Leontief paradox

$p=P_M/P_F=1$	k(0)	Δk/k(0)		*sigma*	w(0)=w(re	w(0)/r(0)	r(0)/w(0)	k/(w/r)	α_x(w/r)
Case 1. Total	7.5799		(Δ(w/r)/(w/r)		4.3645	85.68	0.0117	0.0885	7.5799
H: capital-goods	5.5958	0.0000	0.0000	#DIV/0!	4.1886	68.53	0.0146	0.0817	5.5958
F: consumption-goo	8.9382	0.0000	0.0000	#DIV/0!	4.4848	96.30	0.0104	0.0928	8.9382
								$=\alpha/(1-\alpha)=\alpha_x$	=k(0)
Case 2. Total	7.5799				4.3645	85.68	0.0117	0.0885	7.5799
H: capital-goods	4.4766	-0.2000	0.1999	1.0003	4.1886	82.23	0.0122	0.0544	4.4766
F: consumption-goo	9.7043	0.0857	(0.0857)	1.0002	4.4848	88.05	0.0114	0.1102	9.7043
Case 3. Total	7.5799				4.3199	84.81	0.0118	0.0894	7.5799
H: capital-goods	4.8826	-0.1275	(0.5854)	-0.2177	1.8127	28.41	0.0352	0.1719	4.8826
F: consumption-goo	9.9313	0.1111	0.4872	-0.2281	6.5055	143.22	0.0070	0.0693	9.9313

Note: When the effective labour is used, the current wage rate and the profit rate are connected with *k* (0).

Rybczenski [1955] only holds under the condition of H-O.

9. Introduction of relative price level, $p=P_H/P_F$: Duality [Jones, R. W., 1965]

S-Samuelson [1941]

$r_F=r_F(0)=\partial Y_F/\partial K_F$ $r_H(0)_{nominal}=p\cdot(\partial Y_H/\partial K_H)$, where $p=P_H/P_F$ $w_F=w_F(0)=\partial Y_F/\partial L_F$ $w_{H(0)nominal}=p\cdot(\partial Y_H/\partial L_H)$

	Marginal productivity	$r_{H(marg.pro.)}$	$r_{F(margi.Pro.)}$	$w_{H(margi.Pro.}$	$w_{F(matgi.pro.)}$	P_H	P_F	$p=P_H/P_F$	Changes (%)
Case 1.	Total	0.05094		4.3645					for r & w
	H: capital-goods	0.06112		4.1886		1		1	0.8334
	F: consumption-goods		0.04657		4.4848		1		1.0438
Case 2.	Total	0.05094		4.3645					1.0937
	H: capital-goods	**0.05094**		4.1886		1		1.0000	0.9754
	F: consumption-goods		0.05094		4.4848		1.0000		1.0000
Case 3.	Total	0.05094		4.3199					0.4328
	H: capital-goods	0.06380		1.8127		1.0000		1.0000	1.0000
	F: consumption-goods		0.04542		**6.5055**		1.0000		1.4506

T16 Case 1. Both countries have different rates of profit and the wage rates **Findlay [1960]**

World=capital-ample country+labour-ample country: W=H+F 6152.00 $A(0)=k(0)^{1-\alpha}/\Omega(0)$

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	196.47	303.53	500	5652	6152.00	1253.00	1056.53	4.0295
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.08127	1.59558	0.05094	7.5799	4.7506	**0.20367**	0.3929	0.17740	0.03194	0.17174	4.3645
H: capital-ample country			K: 0.7	L W: 0.3						
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	263.76	2944.80	108.00	72.00	180.00	2204.28	2384.28	413.49	305.49	7.5343
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.07549	1.23509	0.06112	11.1648	9.0397	0.17342	0.6000	0.13421	0.04530	0.12813	8.3572
F: laour-ample country			K: 0.3	L W: 0.7						
n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1031.24	6871.20	88.47	231.53	320.00	3447.72	3767.72	839.51	751.04	3.1100
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.08493	1.82370	0.04657	6.6630	3.6536	0.22282	0.2765	0.20413	0.02348	0.19933	3.3433

When $\Omega_{H(0)}<\Omega_{F(0)}$ is used, the model does not work between *r* and *w* $Y_{H(0)}/Y_{F(0)}$ 0.63282 $\Omega_{H(0)}<\Omega_{F(0)}$

1. Basic variables and parameters under convergence (*delta=alpha*)

	$g_Y{}^*=g_K{}^*$	$g_A{}^*$	$g_y{}^*$	Ω^*	r^*	i	$\beta^*{}_{(\delta=\alpha)}$	n	α
Case 1. World	0.0703	0.0572	0.0623	1.5956	0.0509	0.16933	0.6622	0.00755	0.08127
H: capital-ample country	0.0719	0.0590	0.0638	1.2351	0.0611	0.14780	0.6006	0.00755	0.07549
F: labour-ample country	0.0695	0.0562	0.0615	1.8237	0.0466	0.18295	0.6926	0.00755	0.08493
Case 2. World	0.0776	0.0584	0.0695	1.5956	0.1004	0.18216	0.6795	0.00755	0.16020
H: capital-ample country	0.1218	0.0993	0.1134	1.2351	0.1004	0.24975	0.6023	0.00755	0.12400
F: labour-ample country	0.0552	0.0387	0.0473	1.8237	0.1004	0.13938	0.7226	0.00755	0.18310
Case 3. World	0.2045	(0.0296)	0.1955	1.6393	0.7025	0.30559	1.0969	0.00755	1.15157
H: capital-ample country	0.2922	(0.0277)	0.2825	1.5634	0.7025	0.42908	1.0647	0.00755	1.09821
F: labour-ample country	0.1651	(0.0275)	0.1564	1.6742	0.7025	0.24891	1.1106	0.00755	1.17606

2. Basic variables and parameters under the current situation (*delta>alpha*)

	$g_{Y(a)}$	$g_{K(a)}$	$g_{A(a)}$	$g_{y(a)}$	delta	$\beta_{actual\ (\delta>\alpha)}$	$\beta^*-\beta$	$k(0)$	$y(0)$
Case 1. World	0.0800	0.3000	0.0487	0.0718	0.0977	0.70273	-0.0405	7.5799	4.7506
H: capital-ample country	0.0400	0.4000	0.0292	0.0322	0.1068	0.78710	-0.1865	11.1648	9.0397
F: labour-ample country	0.0215	0.0991	0.0062	0.0139	0.0909	0.96571	-0.2731	6.6630	3.6536
For min capital good growth		0.0509							
Case 2. World	0.0800	0.3000	0.0256	0.0718	-0.1502	0.92504	-0.2455	7.5799	4.7506
H: capital-ample country	0.0400	0.4000	-0.0162	0.0322	0.0452	1.05367	-0.4514	11.1648	9.0397
F: labour-ample country	0.0215	-0.4850	0.1042	0.0139	-0.4889	0.79105	-0.0684	6.6630	3.6536
Case 3. World	0.0800	0.3000	-0.2643	0.0718	45.6596	1227822	-122782	7.5799	4.6238
H: capital-ample country	0.0400	0.4000	-0.3985	0.0322	44.2934	1698641	-169864	11.1648	7.1415
F: labour-ample country	0.0335	51.5281	-60.5650	0.0258	51.1346	3432484	-343248	6.6630	3.9799

$g_{A(a)}=g_{Y(a)}-\alpha g_{K(a)}-(1-\alpha)n$ delta=(n+α(i-iβ*-n))/(i(1-β*)) $\beta_{actual(\delta>\alpha)}$=1−((1/i)(g$_{A(a)}$k(0)^(δ−α))

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3. Relationships between quantities: K_H & K_F and L_H & L_F $K=(a_{KH}\cdot y_H)L_H+(a_{KF}\cdot y_F)L_F$ $K=a_{KH}\cdot Y_H+a_{KF}\cdot Y_F$

For K, $a_{KH}=\Omega_H$ $a_{KF}=\Omega_F$ y_H $a_{LH}=1/y_H$ $L=(a_{LH}\cdot y_H)L_H+(a_{LF}\cdot y_F)L_F$ $L=a_{LH}\cdot Y_H+a_{LF}\cdot Y_F$

For L, $a_{LH}=1/y_H$ $a_{LF}=1/y_F$

	$a_{KH}=\Omega_H$	$a_{KF}=\Omega_F$	y_F	$a_{LF}=1/y_F$	L_H & L_F	Y_H & Y_F	$K=K_H+K_F$	$L=L_H+L_F$
Case 1. World	1.5956		4.7506	0.21050	1295	6152	9816.00	1295.00
H: capital-ample country	1.2351		9.0397	**0.11062**	263.76	2384.28	2945	264
F: labour-ample country		1.8237	3.6536	**0.27370**	1031.24	3767.72	6871	1031
Case 2. World	1.5956		4.7506	0.21050	1295	6152	9816	1295
H: capital-ample country	1.2351		9.0397	**0.11062**	263.76	2384.28	2945	264
F: labour-ample country		1.8237	3.6536	**0.27370**	1031.24	3767.72	6871	1031
Case 3. World	1.6393		4.6238	0.21627	1295	5988	9816	1295
H: capital-ample country	1.5634		7.1415	**0.14003**	263.76	1883.63	2945	264
F: labour-ample country		1.6742	3.9799	**0.25127**	1031.24	4104.20	6871	1031

T16 Case 2. Using r and w with the price level					**Here, start from the proice level**					**Findlay [1960]**
World=capital-ample country+labour-ample country: W						-5473.02	$\Delta Y(0)/Y(0)$	0.00000		$A(0)=k(0)^{1-\alpha}/\Omega(0)$
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	$\Pi(0)$	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	591.32	394.21	985.54	-6458.56	6152.00	1252.96	661.64	3.4342
α	Ω(0)	r(0)	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
0.16020	1.59558	0.10040	7.5799	4.7506	**0.20367**	0.6000	0.11899	0.09612	0.10755	(4.9873)
H: capital-ample country							$\Delta Y_{H(0)}/Y_{H(0)}$	0.00000		
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	$\Pi(0)$	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	263.76	2944.80	177.40	118.26	295.66	-1315.44	2384.28	700.00	522.60	6.7022
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
0.12400	1.23509	0.10040	11.1648	9.0397	0.29359	0.6000	0.23681	0.07440	0.21919	(4.9873)
F: laour-ample coı	Using goal seek, where r_M approaches $r=r_F$						$\Delta Y_{F(0)}/Y_{F(0)}$	0.00000		
n	L(0)	K(0)	$S_{\Pi}(0)$	D(0)	$\Pi(0)$	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1031.24	6871.20	413.93	275.95	689.88	-5143.12	3767.72	552.96	139.03	2.5817
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_{Π}	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
0.18310	1.82370	0.10040	6.6630	3.6536	0.14676	0.6000	0.04146	0.10986	0.03690	(4.9873)
When $\Omega_{H(0)}<\Omega_{F(0)}$ is used, the model does not work between *r* and *w*							$Y_{H(0)}/Y_{F(0)}$	0.63282		**$\Omega_{H(0)}<\Omega_{F(0)}$**

4. The Penrose curve, B_K, and the assets valuation ratio, v

		Ω^*	I/K	$g_K{}^*$	Slope B_K	r^*	r_{M^*}	Slope A	Slope B_K/A	$v=1/\beta^*$
Case 1.	World	1.5956	0.1061	0.0703	1.5101	0.0509	0.0337	1.5101	1.0000	1.5101
H: capital-ample country		1.2351	0.1197	0.0719	1.6649	0.0611	0.0367	1.6649	1.0000	1.6649
F: labour-ample country		1.8237	0.1003	0.0695	1.4439	0.0466	0.0323	1.4439	1.0000	1.4439
Case 2.	World	1.5956	0.1142	0.0762	1.4988	0.1004	0.0670	1.4988	1.0000	1.4716
H: capital-ample country		1.2351	0.2022	0.0754	2.6806	0.1004	0.0375	2.6806	1.0000	1.6603
F: labour-ample country		1.8237	0.0764	0.0769	0.9936	0.1004	0.1010	0.9936	1.0000	1.3838
Case 3.	World	1.6393	0.1864	(0.3727)	-0.5002	0.7217	(1.4429)	(0.5002)	1.0000	0.9116
H: capital-ample country		1.5634	0.2745	(0.5980)	-0.4589	0.7025	(1.5306)	(0.4589)	1.0000	0.9393
F: labour-ample country		1.6742	0.1487	(0.3143)	-0.4730	0.7025	(1.4852)	(0.4730)	1.0000	0.9004

5. The relative price level: real vs. nominal

					(a)	Inf or def	(b)		(c)	
		$r(0)$	$r=\partial Yt/\partial Kt$	$P_Y=r(0)/r_{real}$	$r_{M(0)\ given}$	$p_Y=r_{M(0)}/r_{real}$	$r_M{}^*$ at β^*	(a)/(b)	$r_{CB\ given}$	(a)/(c)
Case 1.	World	0.05094	0.05094	1.0000	0.0330	0.6479	0.0337	0.9783	0.027	1.2222
H: capital-ample country		0.06112	0.06112	1.0000	0.0330	0.5399	0.0367	0.8989	0.027	1.2222
F: labour-ample country		0.04657	0.04657	1.0000	0.0330	0.7086	0.0323	1.0231	0.027	1.2222
Case 2.	World	0.10040	0.10040	1.0000	0.0325	0.3237	0.0682	0.4763	0.027	1.2037
H: capital-ample country		0.10040	0.10040	1.0000	0.0300	0.2988	0.0605	0.4961	0.027	1.1111
F: labour-ample country		0.10040	0.10040	1.0000	0.0330	0.3287	0.0726	0.4548	0.027	1.2222
Case 3.	World	0.70246	0.70246	1.0000	0.0310	0.0441	0.7917	0.0392	0.027	1.1481
H: capital-ample country		0.70246	0.70246	1.0000	0.0330	0.0470	0.7479	0.0441	0.027	1.2222
F: labour-ample country		0.70246	0.70246	1.0000	0.0300	0.0427	0.7802	0.0385	0.027	1.1111

Note: If the price level of output, P_Y, is one, real=nominal and the elasticity of substitution, σ, is always 1.0.

$r(real)=\partial Yt/\partial Kt=\alpha AtKt^{\alpha-1}Lt^{1-\alpha}$ and $w(real)=\partial Yt/\partial Lt=(1-\alpha)AtKt^{\alpha}Lt^{-\alpha}$

6. Relationships between price levels: r_H & w_H for P_H and r_F & w_F for P_F **Stolper-Samuelson**

For H,	$P_H=a_{KH}.r_H+a_{LH}.w_H$	When real=nominal, the price level is 1.0.				The elasticity of substitution is 1.0.			
For F,	$P_F=a_{KF}.r_F+a_{LF}.w_F$	r_H	r_F	w_H	w_F	P_H	P_F	$p=P_H/P_F$	
Case 1.	World	0.05094		4.3645		1.0000		1.0000	For p,
	H: capital-ample country	0.06112		8.3572		1		1	using goal
	F: labour-ample country		0.04657		3.3433		1		seek
Case 2.	World	0.10040		-4.9873		-0.8896		-0.8896	Y(0)
	H: capital-ample country	0.10040		(4.9873)		**1.05**		1.05	(5473)
	F: labour-ample country		0.10040		(4.9873)		**1**		6152
Case 3.	World	0.70246		-0.7007		1.0000		1.0000	Y(0)
	H: capital-ample country	0.70246		(0.7007)		**1.00009**		1.00009	5988
	F: labour-ample country		0.70246		(0.7007)		**1**		5988

T16 Case 3. Using r and w with the price level **Here, start from the proice level** **Findlay [1960]**

World=capital-ample country+labour-ample country: W | 5988.00 | $\Delta Y(0)/Y(0)$ | -0.02669 | $A(0)=k(0)^{1-\alpha}/\Omega(0)$

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	Y(0)	S(0)	$S_H(0)$	A(0)
0.00755	1295	9816	4137.22	2758.15	6895.37	-907.37	5987.82	1252.96	-2884	0.4488
α	Ω(0)	r(0)	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	w(0)
1.15157	1.63933	0.70246	7.5799	4.6238	**0.20925**	0.6000	-1.55856	0.69094	-0.48169	(0.7007)

H: capital-ample country | $\Delta Y_{H(0)}/Y_{H(0)}$ | -0.20998

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_H(0)$	S(0)	$S_H(0)$	A(0)
0.00755	263.76	2944.80	1241.17	827.44	2068.61	-184.81	1883.63	700.00	(541.17)	0.5047
α	$\Omega_H(0)$	$r_{H(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{H(0)}$
1.09821	1.56337	0.70246	11.1648	7.1415	0.37162	0.6000	-0.84234	0.65892	-0.28730	(0.7007)

F: laour-ample country | $\Delta Y_{F(0)}/Y_{F(0)}$ | 0.08930

n	L(0)	K(0)	$S_\Pi(0)$	D(0)	Π(0)	W(0)	$Y_F(0)$	S(0)	$S_H(0)$	A(0)
0.00755	1031.24	6871.20	2896.06	1930.70	4826.76	-722.57	4104.20	552.96	(2343.10)	0.4277
α	$\Omega_F(0)$	$r_{F(0)}$	k(0)	y(0)	s	s_Π	s_H	$s_{S\Pi/Y}$	$s_{SH/Y}$	$w_{F(0)}$
1.17606	1.67419	0.70246	6.6630	3.9799	0.13473	0.6000	-1.93943	0.70563	-0.57090	(0.7007)

When $\Omega_{H(0)}<\Omega_{F(0)}$ is used, the model does not work between *r* and *w* | $Y_{H(0)}/Y_{F(0)}$ | 0.45895 | **$\Omega_{H(0)}<\Omega_{F(0)}$**

7. The neutrality of financial assets and the coeffcient *x=r/w*

ke*=Ω*^(1/(1−α)) $x_e^*/x_0=k(0)/ke^*$

	$r_{CB\ given}$	r_M^* at β^*	r^*/r_{M^*}	$c_{CB}=r_M^*/r_{CB}$	α_x	$x_0=\alpha_x/k(0$	ke*	$x_e^*=\alpha_x/ke^*$	x_0/x_e^*
Case 1. World	0.027	0.0337	1.5101	1.24929	0.0885	0.0117	1.6629	0.0532	0.2194
H: capital-ample country	0.027	0.0367	1.6649	1.35976	0.0817	0.0073	1.2566	0.0650	0.1125
F: labour-ample country	0.027	0.0323	1.4439	1.19458	0.0928	0.0139	1.9283	0.0481	0.2894
					$\alpha_x=\alpha/(1-\alpha)$				
Case 2. World	0.027	0.0682	1.4988	2.48101	0.1908	0.0252	1.7443	0.1094	0.2301
H: capital-ample country	0.027	0.0605	2.6806	1.38724	0.1416	0.0073	1.2726	0.1112	0.0658
F: labour-ample country	0.027	0.0726	0.9936	3.74243	0.2241	0.0139	2.0866	0.1074	0.1297
Case 3. World	0.027	0.7917	(0.5002)	-53.439	(7.5978)	0.0117	0.0383	(198.15)	(0.0001)
H: capital-ample country	0.027	0.7479	(0.4589)	-56.688	(11.182)	0.0073	0.0106	(1058.2)	(0.0000)
F: labour-ample country	0.027	0.7802	(0.4730)	-55.006	(6.6800)	0.0139	0.0536	(124.73)	(0.0001)

Note: When the effective labour is used, the coefficient, x_0 and x_e, are connected with ke(0) (see also below).

8. Data for the Heckscher-Ohlin, Rybczynski, the Stolper-Samuelson, and Leontief paradox

$p=P_M/P_F=1$	k(0)	Δk/k(0)		sigma	w(0)=w(re	w(0)/r(0)	r(0)/w(0)	k/(w/r)	α_x(w/r)
Case 1. World	7.5799	(Δ(w/r)/(w/r)			4.3645	85.68	0.0117	0.0885	7.5799
H: capital-ample country	11.1648	0.0000	0.0000	#DIV/0!	8.3572	136.72	0.0073	0.0817	11.1648
F: labour-ample country	6.6630	0.0000	0.0000	#DIV/0!	3.3433	71.79	0.0139	0.0928	6.6630
								$=\alpha/(1-\alpha)=\alpha_x$	=k(0)
Case 2. World	7.5799				(4.9873)	-49.67	-0.0201	-0.1526	-9.4756
H: capital-ample country	11.1648	0.0000	(1.3633)	0.0000	(4.9873)	-49.67	-0.0201	-0.2248	-7.0317
F: labour-ample country	6.6630	0.0000	(1.6919)	0.0000	(4.9873)	-49.67	-0.0201	-0.1341	-11.1340
Case 3. World	7.5799				(0.7007)	-1.00	-1.0026	-7.5993	7.5784
H: capital-ample country	11.1648	0.0000	(1.0073)	0.0000	(0.7007)	-1.00	-1.0026	-11.1933	11.1541
F: labour-ample country	6.6630	0.0000	(1.0139)	0.0000	(0.7007)	-1.00	-1.0026	-6.6800	6.6630

Note: When the effective labour is used, the current wage rate and the profit rate are connected with *k*(0).

$r=(y_FP_F-y_HP_H)/(\Omega_Fy_F-\Omega_Hy_H)$ $w=(y_Fy_H(\Omega_HP_F-\Omega_FP_H))/(\Omega_Hy_H-\Omega_Fy_F)$

9. Introduction of relative price level, $p=P_H/P_F$: Duality [Jones, R. W., 1965] S-Samuelson [1941]

$r_F=r_F(0)=\partial Y_F/\partial K_F$ $r_H(0)_{nominal}=p\cdot(\partial Y_H/\partial K_H)$, where $p=P_H/P_F$ $w_F=w_F(0)=\partial Y_F/\partial L_F$ $w_{H(0)nominal}=p\cdot(\partial Y_H/\partial L_H)$

	Marginal productivity	$r_{H(marg.pro.)}$	$r_{F(margi.Pro.)}$	$w_{H(margi.Pro.}$	$w_{F(matgi.pro.)}$	P_H	P_F	$p=P_H/P_F$	Changes (%)
Case 1.	Total	0.05094		4.3645		1.0000		1.0000	for r & w
	H: capital-goods	0.06112		8.3572		1		1	(3.8404)
	F: consumption-goods		0.04657		3.3433		1		11.4912
Case 2.	Total	-0.11286		5.6060		-0.8896		-0.8896	2.1559
	H: capital-goods	**-0.23474**		11.6605		-0.4277		(0.4277)	15.0836
	F: consumption-goods		0.10040		(4.9873)		1		1.3953
Case 3.	Total	0.70244		(0.7007)		1.0000		1.0000	(0.0838)
	H: capital-goods	0.70240		(0.7006)		1.0001		1.0001	(1.4917)
	F: consumption-goods		0.70246		**(0.7007)**		1		(0.2096)