

Capital accumulation and coordinated wage bargaining

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1 Preface

I would like to thank my supervisor Halvor Mehlum for giving me the opportunity to develop his idea of including coordinated wage bargaining in a model of uneven development. I am grateful for all his help and his enthusiasm for this project. I also thank the Center of Equality, Social Organization and Performance (ESOP) for granting me a student scholarship. Finally, I would like to thank my fellow students, my friends and family for all their support.

2 Summary

This thesis sets forth an expansion on a model of uneven development, developed by Paul Krugman, in his article “Trade, Capital Accumulation and Uneven Development” from 1981. Krugman (1981) explains the phenomenon of uneven development in a model, in which the world consists of two regions trading with each other.

There are two sectors in Krugman’s model: an industrial sector and an agricultural sector. The agricultural sector is characterised by constant returns to scale. In the industrial sector, on the other hand, there are external economies, and so increasing returns to scale in the sector as a whole. Each firm in this sector, however, is characterised by constant returns to scale. In line with classical growth theory it is assumed that all profits are saved, while all wage income is spent on consumption.

Due to the external economies in the industrial sector, the region that starts off with the most capital will have the highest productivity. The initial lead in industrial development will cumulate over time, and this region will take the leadership in world trade. In this way, trade with the more developed region will prevent industrialisation in the less-developed region.

This thesis proposes two changes on this and works out the effects of these changes. First, the state is assumed to subsidise education. This results in two different labour productivities. The workers with education are assumed to be more productive in the industrial sector than the workers without education. This will change the wage development in the model. The wages of the educated workers will increase when the agricultural sector is emptied of this type of labour. As wages increase, the profit rate will decrease, and so will the rate of investments. This will slow down the development, and may even lead to stagnation if the world price of manufacturing goods is low.

Second, the thesis will explore the possible effects of coordinating wage bargaining. As long as wage bargaining is decentralised, each worker will try to get the highest wage possible. Higher wage demands slow down the economic development. This thesis will show that if the workers moderate their wage demands for a period,

in some cases they will be better off in the long run.

The effect one worker would have on the economy by moderating his wage demands would be minimal, and so it will not outweigh the private gains of a higher wage. Thus, it will not pay for a single worker to moderate his wage demands. If wage demands are coordinated, however, the workers will be able to internalise some of the effects of the wage setting. In some cases, this will lead to temporary wage moderation, so that the capitalists can invest in capital and promote economic development.

In section 4 I discuss the assumption about increasing returns to scale due to external economies in the industrial production, and this phenomenon's role in the literature. In section 5, I present the model, which will be the basis for the analysis in section 6. In the analysis, I will study different development paths in three different situations: autarky, a small open economy and a world of two regions. In the two latter situations, I will look at what role coordinated wage bargaining can play in determining the economic development. In section 7, I discuss some of the main assumptions and results, and finally, in section 8, I sum up the main results of the thesis.

When working on this thesis I have done all calculations and made all the diagrams in Maple.

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3 Introduction

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4 External economies and increasing returns

The assumption about increasing returns due to external economies in the manufacturing sector is central in Krugman's model, and I will in the following discuss this phenomenon's role in the literature. The lines can be seen to go back to Adam Smith and his main work "An inquiry into the nature and causes of the wealth of nations" from 1776. In his time, the term "increasing returns" was not established yet, but his discussion about the division of labour is very much related to what is now known as increasing returns.

4.1 Adam Smith and the division of labour

Adam Smith puts a lot of emphasis on the role of the division of labour in explaining why countries get rich. Indeed, the first three chapters of "The wealth of nations" is about the division of labor, and the very first sentence shows the emphasis he puts on it: "The greatest improvement in the productive powers of labour, and the greater part of the skill, dexterity, and judgment with which it is anywhere directed, or applied, seems to have been the effect of the division of labour" (Smith 1976, page 3). By "division of labour" he means that production processes are subdivided into different tasks, where each worker specialises in doing one or a couple of tasks. Smith argues that there is more room for such division of labour in the manufacturing sector than in the agricultural sector.

Smith illustrates the profitability of the division of labour in an example about a pin factory. A worker not trained in this production (which would be the case without division of labour), would produce at most one pin a day. In Smith's time, the processing of pins was divided into different tasks, where each worker performing one or more of these. In the factory in Smith's study, there were 18 such tasks, divided between 10 workers: one worker drew out the wire, another straightened it, a third cut it off, etc. In this manner, the workers managed to produce 48 000 pins a day, that is 4800 pins per worker.

According to Smith, this increase in production is a result of three circumstances. First, the workers develop knowledge and experience by specialising in one task. Second, the workers save time by not having to change tasks. In many cases, the different tasks have to be performed in different places, and with different tools. Moreover, the worker has to prepare himself mentally to perform a different task. If the workers have to change tasks all the time, a lot of time is spent on this. Third, workers performing the same task over and over again are, according to Smith, more likely to invent machines that could make their work easier. In Smith's time, this was how most inventions were done. Today, division of labour has gone further, as Smith foresaw. Specialisation leads to inventions of new technology and new ways to organise production. As communication is better than before, new innovations are spread quickly and easily between the different firms.

Through these three circumstances, the division of labour leads to the wealth of society. Two workers producing two goods will be able to produce more if each specialises in producing one good rather than if both produce two different goods. By interacting in the market, both workers will be better off. It is interesting to note, however, that the gains of trade are attributed to specialisation, and not to an underlying difference in talents. Smith emphasizes that the differing in talents is less than we think, and that most talents are developed by specialisation. This analysis is different from David Ricardo's theory of comparative advantage, according to which gains of trade are attributed to underlying differences in talents and technology

(Arrow 1979). In this manner, Smith can be seen as a forerunner to what is now called the theory of endogenous growth, which I will come back to in section 4.5.

It follows from the discussion above that an increased division of labour leads to increased trade and increased profitability. However, the causality also goes the other way: increased trading leads to an increased division of labour. In Smith's own words: "As it is the power of exchanging that gives occasion to the division of labour, so the extent of this division must always be limited by the extent of that power, or, in other words, by the extent of the market" (Smith 1976, page 17). The argument is that if the market is very small, it can be unprofitable to specialise in performing one task. The demand for this task would be too small. If the market is small, it is better to perform a range of tasks. An extension of the market would give room for a higher degree of division of labour.

To sum up, gains of trade are due to the division of labour, but the division of labour again depends on how much is traded.

4.2 Alfred Marshall and external economies

While the classical economists and Adam Smith in particular, were occupied with explaining economic development over time, the new Marginalists worked with static analysis of optimal resource allocation and equilibrium theory. Their procedure was maximisation of total product value. However, this required an assumption of decreasing returns to scale. Alfred Marshall, a Marginalist, realised that this assumption was incompatible with Adam Smith's theory of the division of labour. Marshall solved this problem by introducing a division between the concepts of internal and external economies. Internal economies are those internal to the firm, characterised by decreasing marginal costs. When internal economies are present in a production process, the processing industry will be monopolised. This was not a general tendency Marshall observed. External economies, on the other hand, are effects that lead to higher productivity or lower costs in a firm, but that are outside the firm's control. Such economies are external to the single firm, but internal to

the industry. Increased production in an industry will give higher productivity or lower costs in each firm (Buchanan 1996).

Marshall concluded that an appropriate assumption about the economy is that there is perfect competition between the firms, but sectors of firms were characterised by external scale economies (Sandmo 2006). This is also the assumption in Krugman (1981), and the model I will present.

External economies imply that the market will not be efficient, as the single firm will not take into account the external effects on productivity of increasing its production. Marshall argued that state subsidies to industries characterised by external economies would improve the efficiency (Buchanan 1996).

4.3 Allyn Young and increasing returns

More than 150 years after the publication of “An inquiry into nature and causes of the wealth of nations”, Allyn Young (1928) revived Adam Smith’s teachings on the division of labour. Young was concerned with the development of economic theory. He held that neoclassical analyses of supply and demand, for which Marshall was an important contributor, only gave a partial aspect of a process that should be considered as a whole. He felt that the neoclassical theorists were on the wrong track.

Young (1928) considered Adam Smith’s theorem that the division of labour is limited by the extent of the market as “one of the most illuminating and fruitful generalisations which can be found in the literature of economics” (page 529). Young uses the concept of the division of labour in a more general sense than does Smith. Even if Adam Smith’s example of the pin factory can be interpreted as a metaphor for the society as a whole, as does Buchanan (1996), his main focus is still on division of labour between people. Workers become more productive when they specialise. Young (1928) holds that Smith overlooked the main aspect of the division of labour, which is that complex processes are subdivided into smaller processes, where in some machinery can be used. By using more specialised machines,

each performing a particular task, the division of labour is furthered. However, this division of labour between specialised machines is profitable only when the market is sufficiently large: “How far it pays to go in equipping factories with special appliances for making hammers or for constructing specialized machinery for use in making different parts of automobiles depends again upon how many nails are to be driven and how many automobiles can be sold” (page 530). By “large market” he intended great purchasing power. Purchasing power is itself a result of production, so there is a circular relationship that gives development: “Change becomes progressive and propagates itself in a cumulative way” (page 533).

Young’s article did not get so much attention in his time (Buchanan 1996), but is today regarded a part of the classical literature on increasing returns and endogenous growth. The idea about the circular relationship was brought up again in the 1950’s by the economists Ragnar Nurkse (1952), Gunnar Myrdal (1957) and Paul A. Baran (1957). There is a lot in common between Young’s article and this literature, although only Baran refers to Young. However, Nurkse, Myrdal and Baran have a different starting point than Young had; while Young tries to explain economic development, these authors wish to explain economic underdevelopment.

4.4 Cumulative processes and balanced growth

The circular relationship Nurkse, Myrdal and Baran have as their starting point is the vicious circle of poverty. Nurkse (1952) explains this concept as “a circular constellation of forces tending to act and react upon one another in such a way as to keep a poor country in a state of poverty” (page 1). He illustrates the concept with a poor man who does not have money for food. When he does not eat he will be undernourished and become physically ill, and in a poor state to work. This again will lead to poverty and undernourishment, which will make it even harder to make money for food. A situation like this, for a country as a whole, is summed up in one sentence: “a country is poor because it is poor” (page 1).

All three are quick to explain that the circle is not impossible to break. Breaking

the vicious circle brings you into a virtuous circle, which can be compared to what Adam Smith and Allyn Young discussed. Myrdal (1957) characterises this circle as a cumulative process that goes upwards instead of downwards. He illustrates that the process can go both ways by a quote from the Bible: “For unto every one that hath shall be given, and he shall have abundance: but from him that hath not shall be taken away even that which he hath” (page 12). He holds that these cumulative processes have been neglected in economic theory, which has focused on stable equilibria. Nevertheless, he holds, cumulative processes have always been present in people’s conscience, as is clear from the Bible quote. Myrdal argues that the proposition that the economy goes towards a stable equilibrium between opposing forces is wrong in most cases. On the contrary, the economy normally moves away from balanced situations. One change leads to new changes in the same direction. There is a circular causality between changes that draw in the same direction and strengthen each other. Baran (1957) illustrates the circular relationship with a metaphor of a snowball that rolls and gets bigger. He used this metaphor of the snowball effect in particular to characterise how investments encourage other investments. Investments enlarge the market and make it profitable for other investments. This chain reaction is what gives economic development. However, as he writes: “Just as investment tends to become self-propelling, so lack of investment tends to become self-perpetuating” (page 175).

So what are the mechanisms that keep a country in poverty? Both Nurkse, Myrdal and Baran underline the importance of capital accumulation in creating economic development. Nurkse (1952) analyses the problem from two sides: the demand side and the supply side. Demand for capital depends on the willingness to invest, while supply of capital depends on the willingness to save. On both sides he sees a circular relationship that may inhibit capital accumulation. On the supply side, low incomes make it difficult to save. The low incomes are caused by the low productivity, which is a result of little use of capital in production, which again is caused by low saving. On the demand side, there is a similar pattern: low willingness

to invest is a result of poor sale prospects caused by low purchasing power. Low purchasing power is a result of low incomes, which is caused by low productivity, which again is caused by a low willingness to invest, and so it goes.

The relationship on the demand side is the same as Adam Smith and Allyn Young focused on in the theorem that the division of labour is limited by the extent of the market, if “the division of labour” is interpreted in a general sense. Nurkse illustrates this theorem with an example of the decision to invest in a shoe factory in a poor country, where people hardly can afford what they need for food, clothes and housing. The workers in the factory will not use their entire income on shoes, and if there are no further productivity increases in the economy, the market for shoes will be too small. The investment will be unprofitable.

The solution, according to Nurkse, lies in the idea of balanced growth. An increase in the shoe production alone does not create its own demand. A balanced increase in the production of a whole range of consumables, on the other hand, will create its own demand. Nurkse does not reference much, but it is clear that he is inspired by Rosenstein-Rodan (1943), a classic article in the literature on balanced growth. The theory presented in this article has become to be known as the “big push” theory, and has later been formalised by Murphy et al. (1989).

Murphy et al. (1989) explain the doctrine of balanced growth as consisting of two elements: “First, the same economy must be capable of both the backward preindustrial and the modern industrialized state. No exogenous improvement in endowments or technological opportunities is needed to move to industrialization, only the simultaneous investment by all the sectors using the available technology. Second, industrialization is associated with a better state of affairs” (page 1004).

In order to have a big push argument, there must be two equilibria in the economy, where one is better than the other. In the big push model, there is a wage-premium to entice the workers to work in the industrial sector. This ensures that an industrialising firm will raise the size of other firm’s markets even when itself loses money.

Nurkse's example of the shoe factory is almost identical with that of Rosenstein-Rodan, who concludes: "If, instead, one million unemployed workers were taken from the land and put, not into one industry, but into a whole series of industries which produce the bulk of the goods on which the workers would spend their wages, what was not true in the case of one shoe factory would become true in the case of a whole system of industries: it would create its own additional market" (page 205). Nurkse emphasises that such a production increase has to be proportional to the preferences of the consumers.

The problem is how such a balanced production increase is to be financed. This is where Nurkse's supply side comes in; in a poor country the supply of capital will be limited by the low saving. Rosenstein-Rodan emphasises that it will be hard to get financing from the international capital market. Such financing normally goes to single firms that are potentially profitable. A coordinated general production increase needs financing of a whole range of industries.

Myrdal puts the responsibility on the State as a coordinator for the economic development in a poor country. He emphasises that this is not a counterpart to the free market. If a poor country can manage to start a positive cumulative development process, it will, by the positive external effects, create a better environment for the single firm in the free market. The problem of the State will be how to lead income from consumption to investment.

4.5 External economies, increasing returns and international trade

The balanced growth argument discussed above is valid only when goods are not traded internationally. When international trade is introduced, the example of the shoe factory is not as striking. The shoes produced do not necessitate a domestic market. If there is a market for them abroad, they can be exported and sold. Still, more recent literature has shown that external economies and increasing returns are also pertinent to determining the economic development of an open economy.

This literature, known as endogenous growth theory, considers the dynamic aspects of trade, in contrast to the traditional static trade theory of comparative advantage. According to the theory of comparative advantage trade allows a more efficient use of an economy's resources by exporting goods the country can produce relatively cheaper than other countries, and importing goods other countries can produce relatively cheaper. These differences in ability to produce are assumed to be taken as given. Dynamic trade theories, on the other hand, consider how such comparative advantages come to be. Krugman (1987) stresses that "comparative advantage, instead of being determined by underlying attributes of countries, evolves over time". The challenge for governments is to reap the benefits of scale by promoting sectors where there is a scope for productivity increases.

Matsuyama (1991) argues that high productivity in the agricultural sector will make industrialisation more difficult, and the economy may be trapped into a state of pre-industrialisation. One reason for this is that an economy with less productive agriculture will have an abundant supply of cheap labour that the industrial sector can rely on. This statement stands in contrast to the earlier development literature, such as Nurkse (1952) and Rostow (1960), where improvements in agricultural productivity are held to be an essential condition for industrial "takeoff". They argue that improved productivity in the agricultural sector is necessary to feed the industrial workers, generating higher incomes to provide demand for industrial goods and increasing the supply of savings required to finance industrialisation. Matsuyama (1991) argues that this logic is only valid in a closed economy. He holds that many economies have successfully industrialised relying on foreign trade, by importing agricultural products and exporting industrial products. Matsuyama's argument is consistent with the view of Krugman (1987), who stresses the risk of specialising in sectors with a low growth potential, because "arbitrary patterns of specialization, once established, tend to become entrenched over time" (page 41).

In the model I will present, as in Krugman (1981), industrial development is the factor giving economic growth. The external economies in the manufacturing sector,

and the resulting increasing return to capital result in a cumulative process similar to that discussed above. In the world of two regions trading there will exist multiple equilibria. The equilibrium the economies will end up in will depend on patterns of production determined by history. A small lead in industrial development will lead to an equilibrium of partial or full specialisation in industrial production.

The introduction of collective wage bargaining is a way to coordinate behavior in order to promote the manufacturing sector, because this is where the growth potential lies. By coordinating wage demands, the region may increase their competitiveness in industrial production, and maybe end up in a better equilibrium. This type of coordination does not require financing, like the coordination in the big push argument, and may therefore be easier to organise.

5 Model

The model I will present is an expansion on Krugman (1981). The result in Krugman's model is a special case that could occur in my model.

There are two sectors in the economy: a manufacturing sector, M , and an agricultural sector, A . In the industrial sector, labour and capital is used in fixed proportions, while in the agricultural sector, only labour is used as input. All profits are saved and invested in capital, while all wage income is spent on consumption. As capital is accumulated, workers are moved from the agricultural sector to the industrial sector.

The agricultural sector is characterised by constant returns to scale. In the manufacturing sector, there are constant returns to scale in each firm, but increasing returns to scale in the sector as a whole, because of external economies in the industrial production. Perfect competition between the firms is assumed.

The following equations show the resource constraints in the economy:

$$L = E + U \quad (1)$$

$$E = E_M + E_A \quad (2)$$

$$U = U_M + U_A \quad (3)$$

$$L_A = E_A + U_A \quad (4)$$

$$L_M = E_M k + U_M \quad (5)$$

$$L_M + L_A = U + (\gamma k + (1 - \gamma))E \quad (6)$$

$$\gamma = \frac{E_M}{E} \quad (7)$$

$$\rho = \frac{P_M M - w_U U_M - w_E E_M}{K} \quad (8)$$

$$\frac{\dot{K}}{K} = \rho \quad (9)$$

As in Krugman's model, there is a fixed labour stock, L . However, while Krugman's labour stock consists of homogeneous workers, the labour stock in my model consists of two labour types: workers with education, E , and workers without education, U . This is shown in equation (1). Equation (2) and equation (3) show how the two types of labour are divided between the sectors. The high-skill workers are more productive in the manufacturing sector than the low-skill workers, while in the agricultural sector they have the same productivity. Specifically, in the manufacturing sector, the high-skill workers are k times as productive as the low-skill workers. The labour force in each sector, measured in uneducated labour units, is given by equation (4) and (5). Equation (6) and equation (7) show that the total labour stock, measured in uneducated labour units, increases as the proportion of high-skill workers employed in the industrial sector is increased.

In equation (8), ρ is the profit rate, w_U and w_E are the cost of low-skill labour and high-skill labour respectively, and P_M is the relative price of industrial goods. This equation shows that the profit rate is equal to the difference between sales income and costs of production, per unit of capital. Finally, equation (9) shows

that, as all profits are saved, the rate of capital investments is equal to the profit rate.

The technology in the two sectors is given in the following equations:

$$A = L_A \quad (10)$$

$$M = \min \left\{ \frac{K}{c}, \frac{L_M}{v} \right\} \quad (11)$$

$$c = (\bar{c} - \underline{c})A^{-K} + \underline{c} \quad (12)$$

$$v = (\bar{v} - \underline{v})B^{-K} + \underline{v} \quad (13)$$

$$k = aK + \underline{k} \quad (14)$$

Equation (10) says that one labour unit (high-skill or low-skill) produces one unit of agricultural output. Production in the manufacturing sector, on the other hand, requires both capital and labour as inputs. For the individual firm, capital and labour are used in fixed proportions (Leontief technology). In the aggregate, however, technology is given by equation (11), where v and c are unit capital and labour requirements respectively. These are decreasing functions of the economy's capital stock, as given by equation (12) and (13). This is an assumption of increasing returns to scale in the manufacturing sector as a whole. As the manufacturing sector grows, both labour and capital become more productive. Finally, equation (14) shows that k is an increasing function of the capital stock. This is an assumption of “learning-by-doing” or skill-biased technological change. As the manufacturing sector grows, the educated workers become more productive as compared to the uneducated workers. I will follow Krugman (1981) in assuming that the absolute value of the elasticity of unit input requirements with respect to output is less than one. This means that total input requirements will increase when output is increased. Figure 1 and 2 show how the functions $c(K)$ and $v(K)$ may look.

Figure 1: Unit capital requirement

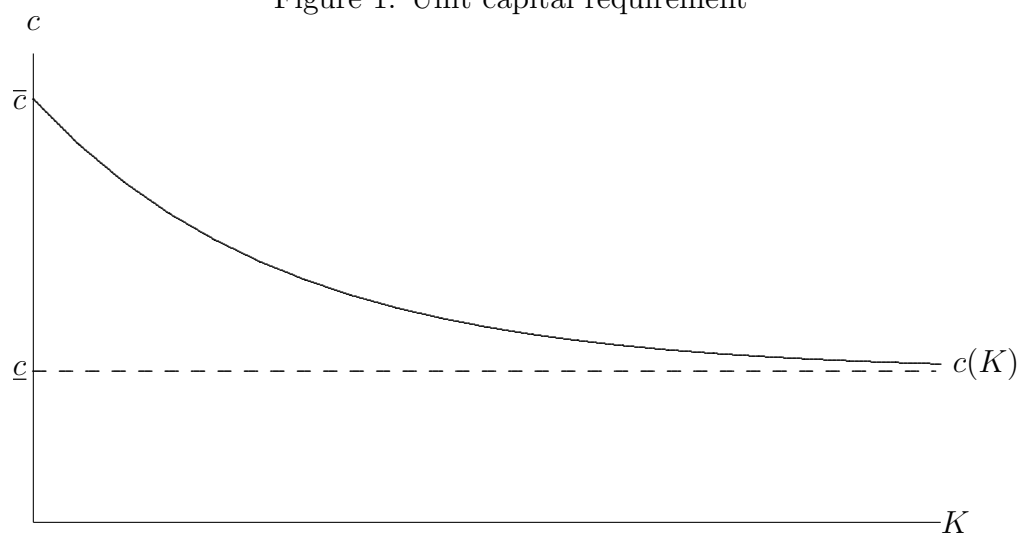
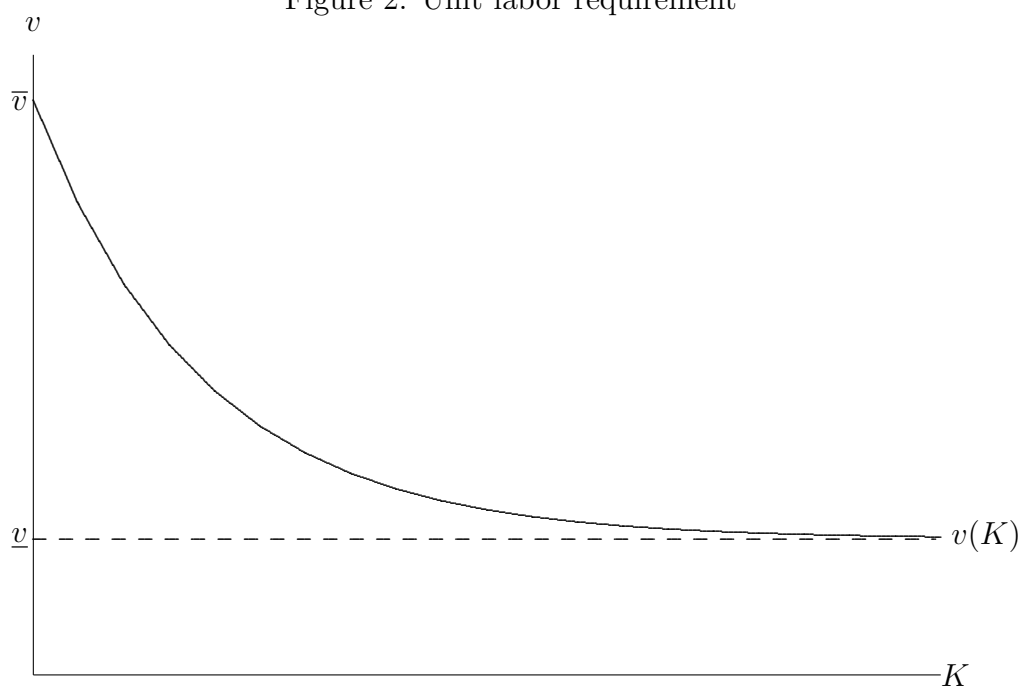


Figure 2: Unit labor requirement



6 Analysis

As a result of the increasing returns to scale in the manufacturing sector, there will be a positive rent in this sector, to be divided between owners of capital and the workers. Because of perfect competition between the firms in the manufacturing sector, profit-maximisation yields the conditions (15) and (16).

$$\frac{K}{c} = \frac{L_M}{v} \quad (15)$$

$$P_M = \rho c + \frac{v}{k} w_E \quad (16)$$

Because of the Leontieff technology, capital and labour will be used in fixed proportions, as in equation (15). Equation (16) says that the price of industrial goods will be equal to the marginal costs of production.

Different combinations of K and P_M will give different regimes. Below, I will describe the different stages of development as regard to wages and employment that follow from the combinations of K and P_M .

The wage structure is given in table 1. The wage in the agricultural sector is normalised to 1 for both types of labour. In the first stage of capital accumulation, high-skill workers are moved from the agricultural sector to the manufacturing sector. These workers are the most productive, and can be paid a wage equal to 1 as long as there are still high-skill workers left in the agricultural sector. When there are no more high-skill workers in the agricultural sector, w_E will be bid up. If the price of industrial goods is low, the wage will increase until the profit rate goes to zero. Setting $\rho = 0$ into equation (16) will give $w_E = \frac{P_M k}{v}$. However, the high-skill

Table 1: Wage structure

	$E_A > 0$	$E_A = 0$
$U_M = 0$	$w_E = 1$ $w_U = 1$	$w_E = \frac{P_M k}{v}$ $w_U = 1$
$U_M > 0$	- -	$w_E = k$ $w_U = 1$

workers can not demand a higher wage than k , because if they did, the firm owners would rather hire the low-skill workers.

The level of K for which the agricultural sector is emptied of educated labour, and the wage is bid up, is found by replacing L_M with Ek , equation (15). Letting \tilde{K} determine this level of K , we will have:

$$\frac{\tilde{K}}{c(\tilde{K})} = \frac{Ek(\tilde{K})}{v(\tilde{K})} \quad (17)$$

In the same manner, the maximum level of K that can be applied in the economy, \bar{K} , can be deduced from (15). This level is reached when the whole labour stock is in the manufacturing sector. We will have:

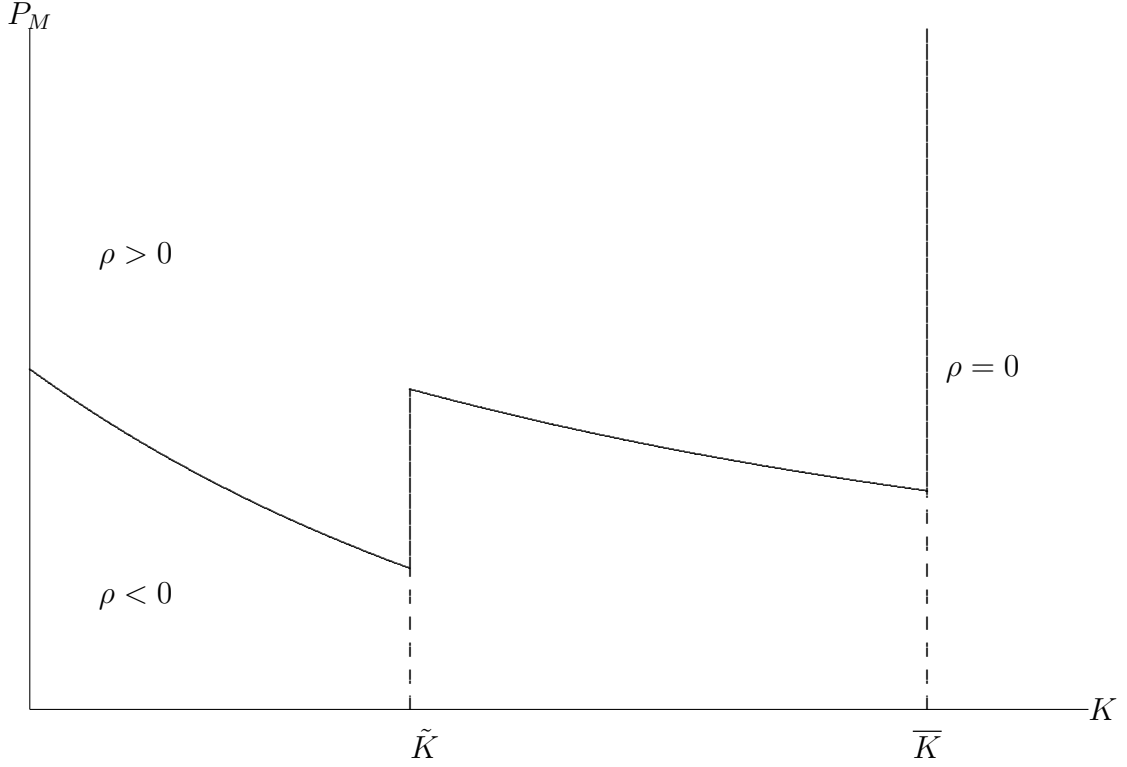
$$\frac{\bar{K}}{c(\bar{K})} = \frac{Ek(\bar{K}) + U}{v(\bar{K})} \quad (18)$$

At \bar{K} , all rents will go to the workers, so that the profit rate will go to zero. For all levels of the capital stock lower than \bar{K} , except at $K = \tilde{K}$, an increase in the capital stock for a given price, or a higher price for a given level of the capital stock will give higher profits. This implies decreasing isoprofit curves. At $K = \tilde{K}$ and at $K = \bar{K}$, there will be a shift in the isoprofit lines, as a result of the wage increase. As the costs of production increase, an increase in the price is needed in compensation to keep the profit rate constant. Figure 3 shows a possible zero profit line. This will be given by equation (19).

$$P_M = \begin{cases} v(K)/k(K) & \text{if } K < \tilde{K}, \\ v(K) & \text{if } K > \tilde{K}. \end{cases} \quad (19)$$

Above the zero profit line, P_M is higher than marginal costs, and so the profit rate is positive. Below the line, P_M is lower than marginal costs, and so profits will be negative. I will use this figure to analyse different development paths in the accumulation of capital. First, I will look at a closed economy, and then proceed to analyse the consequences of opening up for trade for a small economy. Finally, I

Figure 3: Zero profit line



will model a world of two regions trading together.

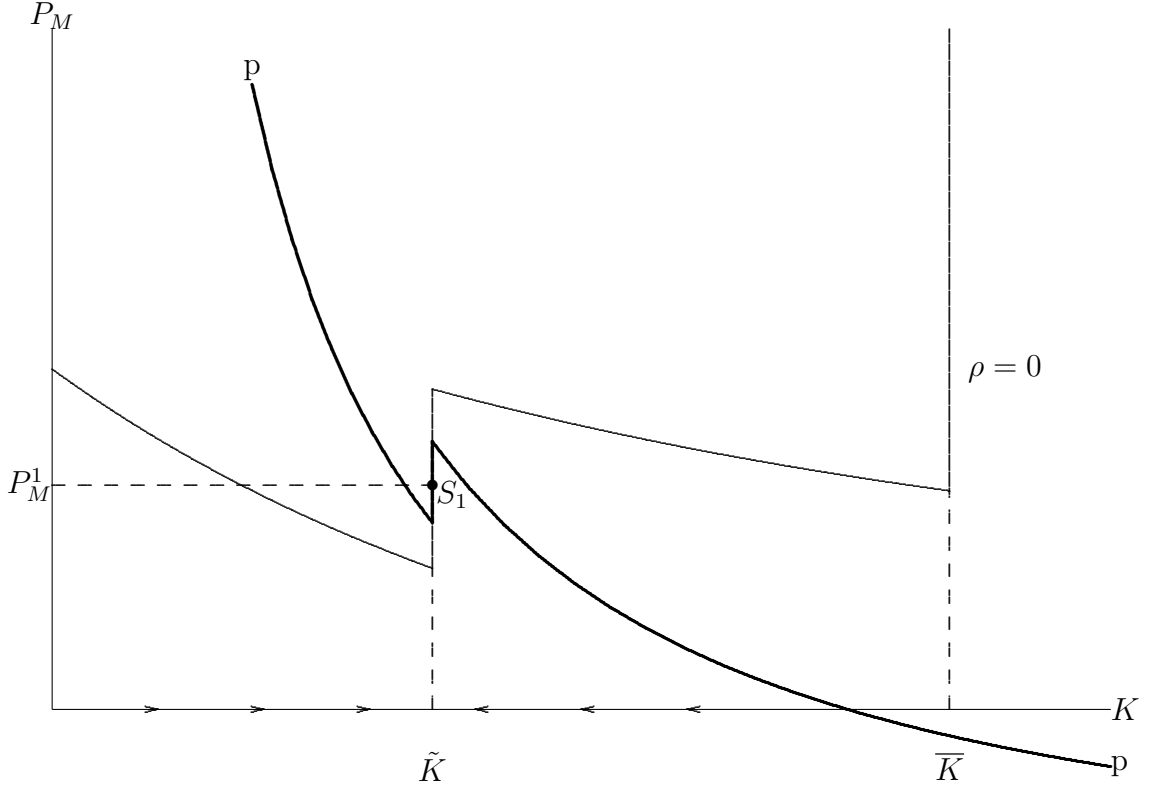
6.1 Autarky

In a closed economy, price and quantity of manufactured goods will depend on domestic demand and domestic supply. I will assume consumers spend a fixed fraction, μ of their income on manufactured goods. It follows that the value of demand is given by:

$$P_M M = \mu(\text{wage income}) = \begin{cases} \mu L & \text{if } K < \tilde{K}, \\ \mu(U + kE) & \text{if } K > \tilde{K}. \end{cases} \quad (20)$$

When $K < \tilde{K}$, all workers earn a wage equal to 1, and so total wage income in the economy is equal to the total labour stock, L . When $K > \tilde{K}$, all high-skill workers are employed in the manufacturing sector. These will earn a wage equal to k , while the low-skill workers will earn a wage equal to 1. It follows that total wage income will be $U + kE$.

Figure 4: Autarky

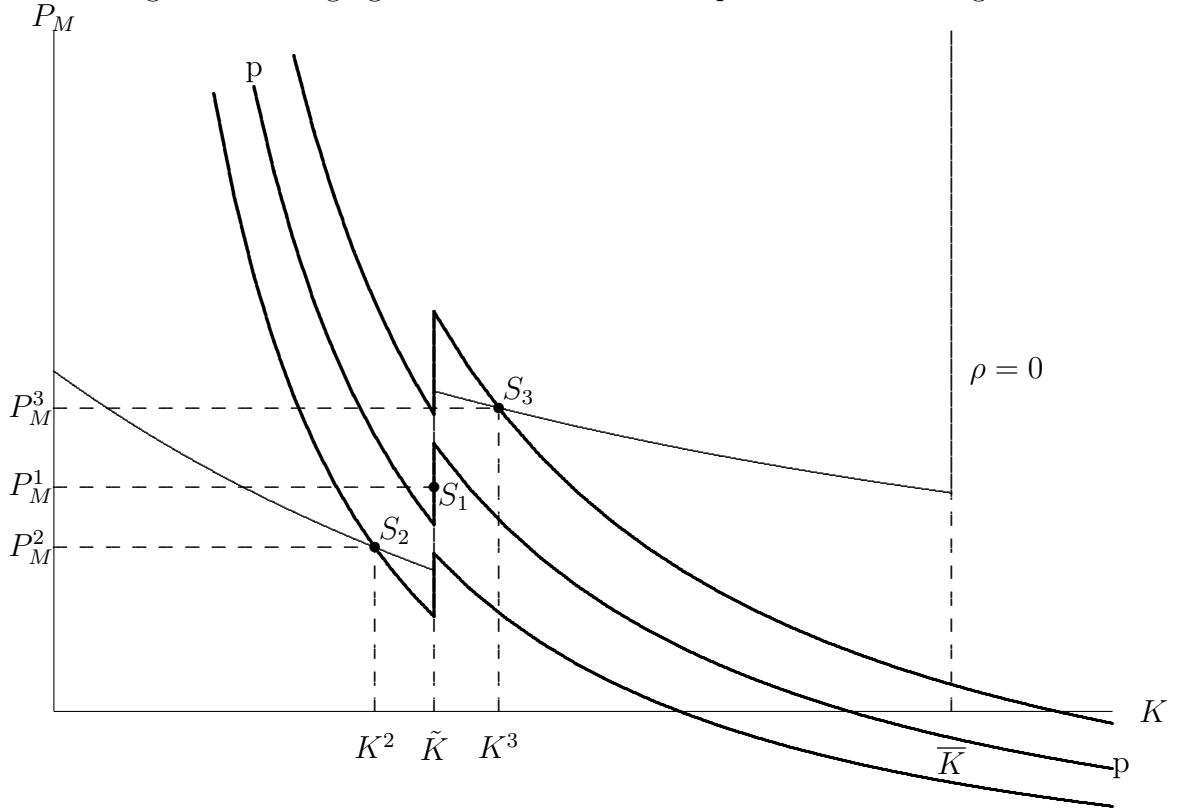


Using, that $M = K/c$, we will have an equation in P_M and K , represented by the pp-line drawn in figure 4. I will call this the price line. The equilibrium will be in S_1 , where demand is equal to supply. At this point, the wage of the high-skill workers is bid up until the profit rate goes to zero, i.e. $w_E = \frac{P_M^1 k(\tilde{K})}{v(\tilde{K})}$.

S_1 is a stable equilibrium, as indicated by the arrows. If $K < \tilde{K}$, the price consumers are willing to pay for the industrial goods implies a positive profit rate, and K will be increasing. If $K > \tilde{K}$, the price consumers are willing to pay implies a negative profit rate, and so the capital stock will be decreasing.

If the parameters take different values, the figure will look differently. Figure 5 shows how the price line will look when the fraction spent on industrial goods changes. If the demand for manufactures decreases, the price line shifts down. In this case, the equilibrium level of the capital stock will be lower. Here, the equilibrium is in S_2 . At this point, the capital stock has not passed \tilde{K} . This means that there still are educated workers in the agricultural sector, and the wage of educated workers is still equal to 1. S_2 is a stable equilibrium. If capitalists make further investments

Figure 5: Changing the fraction of income spent on industrial goods

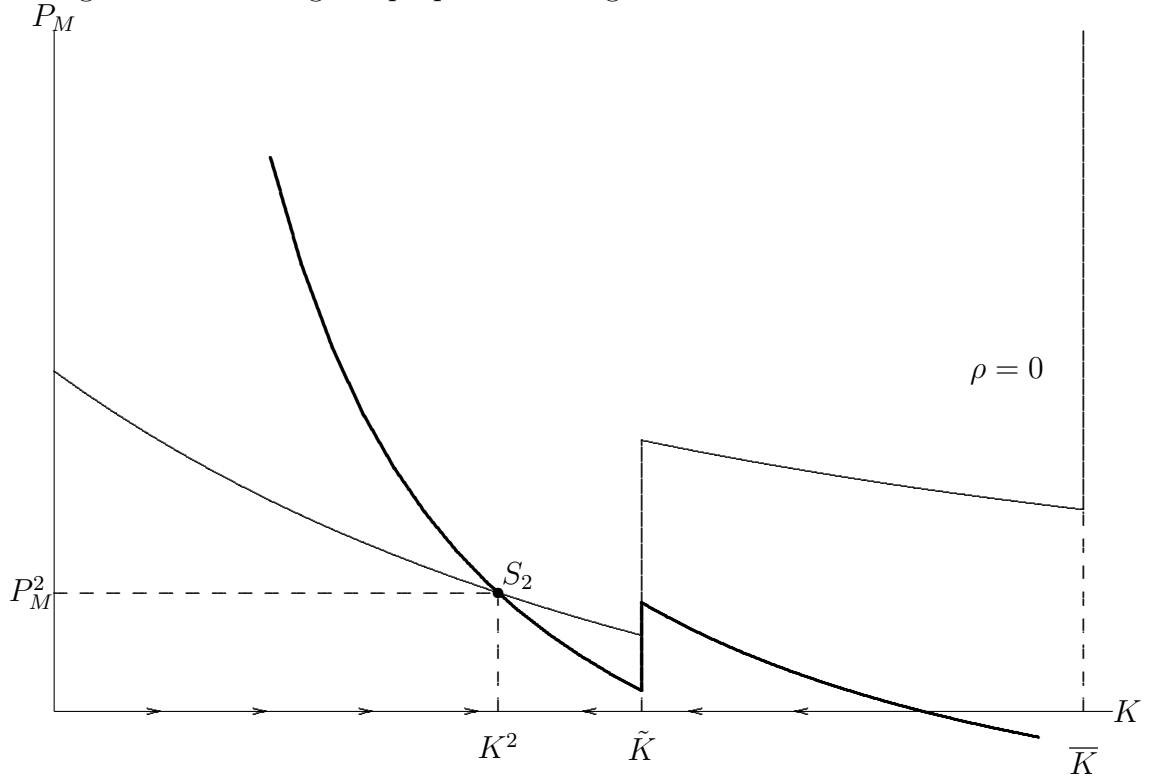


and increase the capital stock beyond K^2 , the price consumers would be willing to pay for the industrial good would be too low to make the investment profitable. This means that the profit rate would be negative, and the capital stock would be built down. If the capital stock is lower than K^2 , the price consumers are willing to pay implies a positive profit rate. Capitalists will invest in capital until the profit rate goes to zero, i.e. until $K = K^2$.

If demand for manufactures goes up, the price line will have a positive shift. In this case, the equilibrium will be in S_3 . At this point, the capital stock has passed \tilde{K} , and so the wage of the workers with education has been bid up to k . Both high-skill and low-skill workers are employed in the manufacturing sector. Equilibrium S_3 is a stable equilibrium, for the same reasons for which S_1 and S_2 are stable.

Figure 6 and 7 show how the figure will look when the proportion of high-skill workers to low-skill workers changes. Figure 6 shows how the figure will look for a high proportion of high-skill workers to low-skill workers. When compared to figure 4, both the zero profit line and the price line have changed. Because the proportion

Figure 6: Increasing the proportion of high-skill workers to low-skill workers

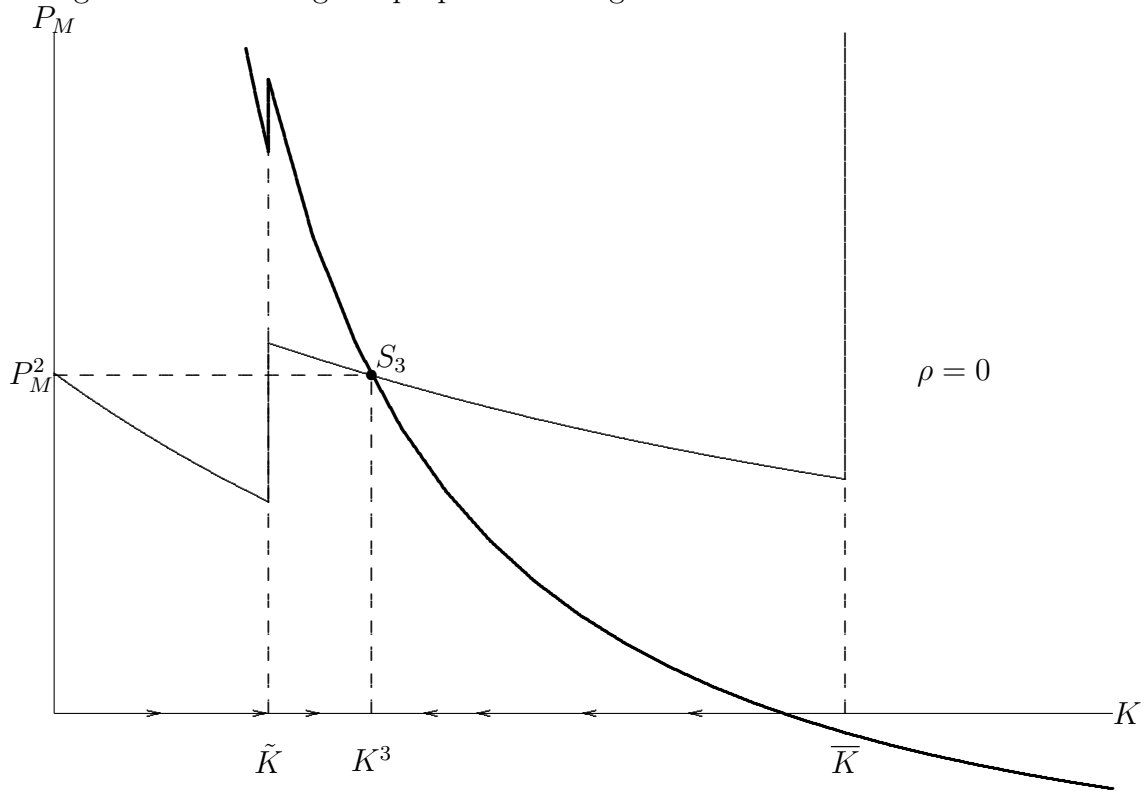


of high-skill workers to low-skill workers has increased, so has the level of the capital stock for which all educated workers have been moved to the manufacturing sector, i.e. \tilde{K} . This means that the curves shift for a higher level of the capital stock. Because \tilde{K} has increased, and k is an increasing function of the capital stock, the shifts in the two curves at \tilde{K} are larger. The level of the capital stock for which all workers are employed in the manufacturing sector, \bar{K} , has also increased, because the proportion of the more productive workers has increased.

There will be a stable equilibrium in S_2 . At this point, $K < \tilde{K}$ and so the more productive workers are still cheap labour.

For a low proportion of high-skill workers to low-skill workers, we will have a situation like that shown in figure 7. In this case the (stable) equilibrium will be at a point where $K > \tilde{K}$, and so the wage of the workers with education has been bid up to k .

Figure 7: Decreasing the proportion of high-skill workers to low-skill workers

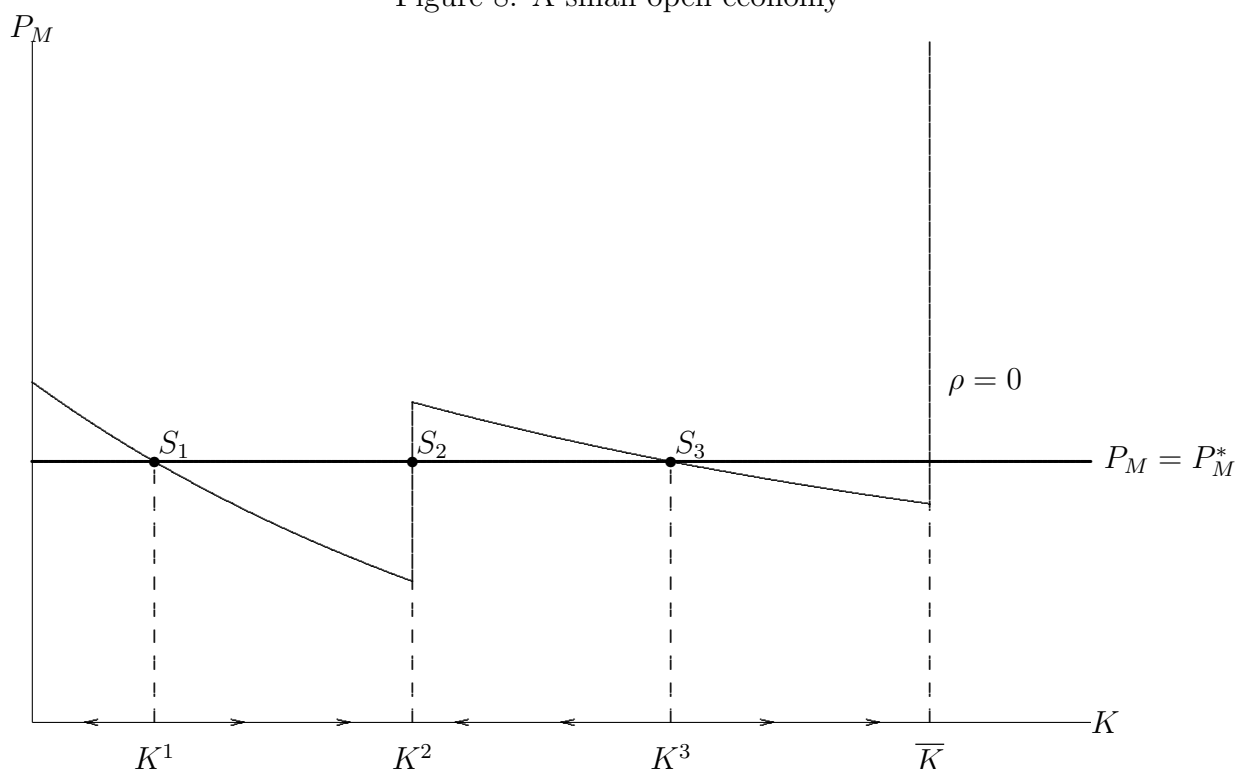


6.2 A small open economy

The section above considered a closed economy, where the price of manufactured goods is determined endogenously by supply and demand. A small open economy, on the other hand, is characterised by the fact that it cannot influence the world price. It follows that the price of industrial goods will be taken as given. This assumption is valid if there are many countries trading, and the small economy's supply and demand are not great enough to have a noticeable effect on the world price.

Figure 8 shows the case where $P_M = P_M^*$. In this case there will be three equilibria, K^1 , K^2 , and K^3 . In each equilibrium, the profit rate is equal to zero. If $K < K^1$, the profit rate will be negative, because the output price is too low to make the investments profitable. It follows that the capital stock will decrease. If $K^1 < K < K^2$, the profit rate will be positive. This is a result of the increase in productivity as the capital stock increases. Because capital investments are profitable, the capital stock will increase. It follows that S_1 is an unstable equilibrium. If $K < K^1$ the

Figure 8: A small open economy



economy will be in a typical case of a poverty trap, that may be escaped through the use of a sort of a "big push", as discussed above. Nevertheless, the capital stock will not exceed K^2 . At K^2 , the wage of high-skill workers is bid up, and the profit rate goes to zero. If $K^2 < K < K^3$, the output price is again too low to make investments profitable. In this interval, the capital stock will be decreasing. It follows that S_2 is a stable equilibrium.

$K = K^2$ is also a sort of a poverty trap. It is interesting to note that in a closed economy, only one equilibrium will exist, while a small open economy may have multiple equilibria. In the closed economy, the price line will be steeper than the zero profit line. Moreover, because workers spend a constant fraction of their wage income on industrial goods, and this fraction can not be higher than 1, the shift in the price line can not be greater than the shift in the zero profit line. It follows that there can be only one equilibrium. The existence of multiple equilibria in a small open economy opens for a possibility of reaching a better equilibrium by coordinating behaviour. Below, I will discuss the role coordinated wage bargaining can play in

escaping the poverty trap at $K = K^2$, and creating economic development.

6.2.1 Coordinated wage bargaining in a small open economy

The poverty trap at $K = K_2$ is a result of the fact that the more productive workers become more expensive when the agricultural sector is emptied of this type of labour. At this point, the wage will be bid up until the profit rate goes to zero, i.e. $w_E = \frac{P_M^* k(K_2)}{v(K_2)}$.

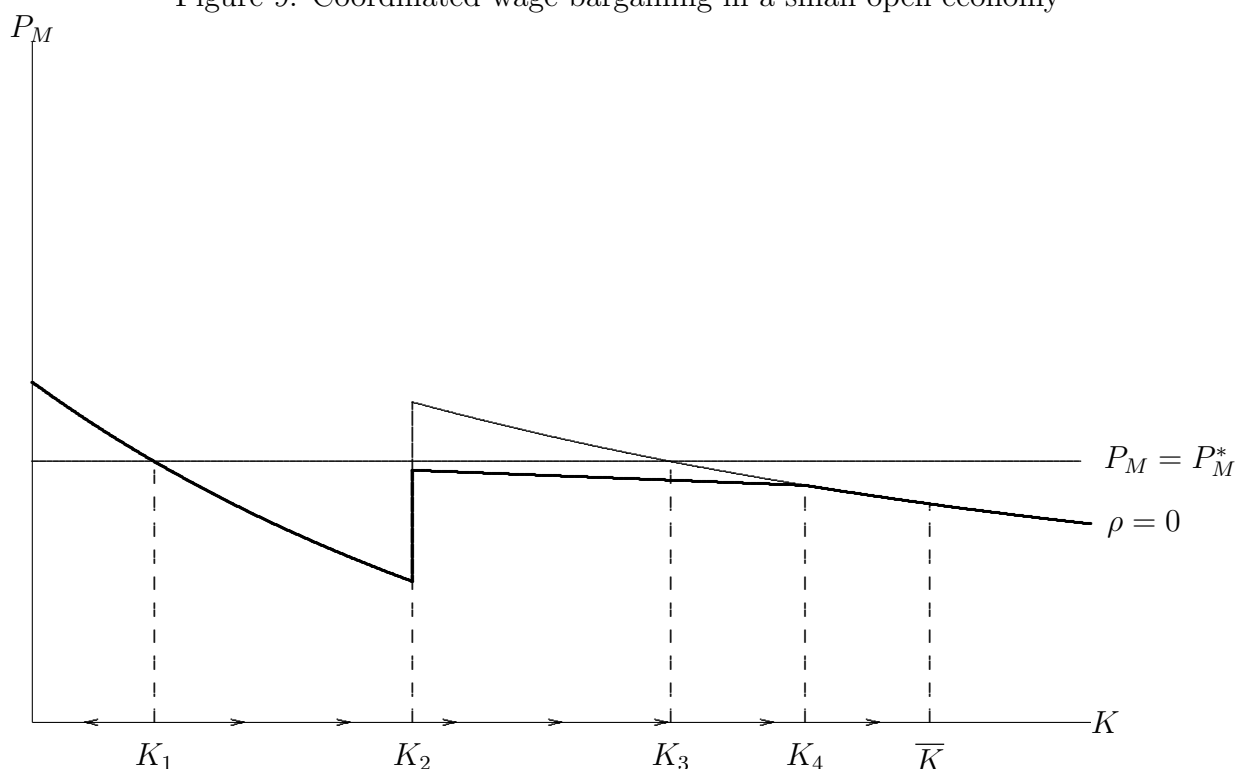
If the workers coordinate their wage demands, they could escape the poverty trap. In section 7.3.2 I will discuss under what circumstances such coordinated wage setting would be feasible.

When workers bargain wages individually, every worker would ask for the highest wage possible. The workers would not consider external effects of their wage demands, because each worker's wage makes only a small fraction of the general wage level. If workers coordinate their wage demands through a union, however, they will consider what would benefit the union. If the workers agree on moderating their wage demands, costs of production decrease. If the wage increase is sufficiently low, the profit rate turns positive and capital will be accumulated and the workers can increase their wage demands.

Figure 9 illustrates the consequences of a possible wage development. The bold line represents the new zero profit line associated with the wage moderation. If this wage development is agreed on, the poverty trap at $K = K_2$ is escaped. The workers moderate their wage demands enough to have the new zero profit line below the price line. This means that profits will be positive, and capital will be accumulated until the capital stock reaches its maximum level, i.e. all workers are employed in the manufacturing sector. At this point, the bargaining power of all workers increase. The wages will increase until the profit rate goes to zero.

In the example shown in figure 9, the educated workers moderate their wage demands enough to get the new zero profit curve below the price line at $K = K_2$. As capital is accumulated, the high-skill workers increase their wage demands until

Figure 9: Coordinated wage bargaining in a small open economy



$K = K_4$. At this point, the wage is equal to k . Because k is increasing in the capital stock, it is clear that the high-skill workers will be better off at this point than without wage moderation. However, this is just one of many possible wage paths.

There will be a trade-off for the workers in determining the wage development. The lower the wage demands, the higher the profit rate will be. A higher profit rate gives a higher rate of capital accumulation. As the relative productivity of the high-skill workers increases as the capital stock increases, they can quickly demand a higher wage than if they increased wage demands earlier. The optimal wage path for the workers will depend on their time preferences. If the time discount factor is very high, it might not be optimal for the workers to moderate their wage demands even if this would lead to higher wages in the future. On the other hand, if the time discount factor is very low, it will be optimal to go for low wages to generate a high profit rate, until the capital stock reaches its maximum level and wages can be increased all the way until the profit rate goes to zero.

6.3 A world of two regions

A big open economy is characterised by the fact that changes in supply and demand will affect the world price. To analyse the problem of a big open economy, I will model the world as consisting of two trading regions. In this analysis I will assume that the two regions are identical in all relevant aspects, except that their capital stock may differ in size. There is no capital mobility. The price of manufactured goods will be determined by setting world demand equal to world supply. This is done in (21). N and S denote the two regions, that I will call North and South. As demand is isoelastic, world demand is found by summing up total demand in the two regions. World demand will be a constant fraction μ of total wage income. The total wage income will in turn depend on the structure of economic activity in each region.

$$P_M(M^N + M^S) = \mu(\text{total wage income}) = \begin{cases} \mu 2L & \text{if } K^N < \tilde{K}, K^S < \tilde{K}, \\ \mu(L + U^N + w_E^N E^N) & \text{if } K^N > \tilde{K}, K^S < \tilde{K}, \\ \mu(L + U^S + w_E^S E^S) & \text{if } K^N < \tilde{K}, K^S > \tilde{K}, \\ \mu(2U + (w_E^N + w_E^S)E) & \text{if } K^N > \tilde{K}, K^S > \tilde{K}. \end{cases} \quad (21)$$

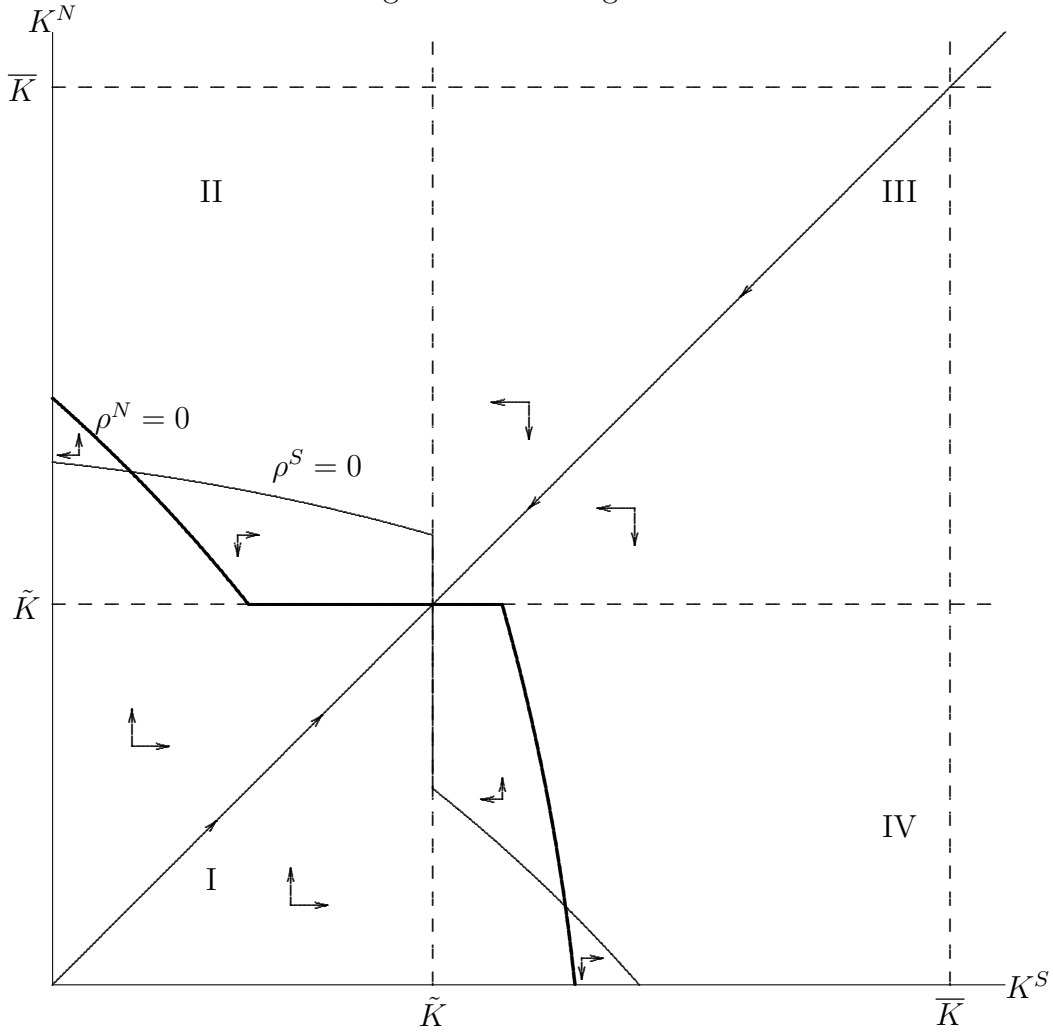
Substituting for w_E and using that for $\rho_N = 0$, P_M will be given by equation 22,

$$P_M = \begin{cases} v(K^N)/k(K^N) & \text{if } E_A^N > 0, \\ v(K^N) & \text{if } E_A^N = 0. \end{cases} \quad (22)$$

a zero profit line for the North can be determined. This will be an equation in (K^N, K^S) . Such an equation for the South can be found analogously. Figure 10 illustrates two possible zero profit lines. The steepest profit line is that of the North.

The figure is divided into four areas. In area I, $K^S < \tilde{K}$ and $K^N < \tilde{K}$, and so the wage in both regions is equal to 1. In area II, $K^S < \tilde{K}$ and $K^N > \tilde{K}$, and so the wage is equal to 1 in the South, but $w_E^N > 1$. In area III, $K^S > \tilde{K}$ and $K^N > \tilde{K}$, and

Figure 10: Two regions I



so the wage has been bid up in both regions. Finally, in IV, $K^S > \tilde{K}$ and $K^N < \tilde{K}$, and so the wage is equal to 1 in the North, but $w_E^S > 1$.

The shifts in the profit lines represent the fact that higher domestic wage makes investments less profitable, while higher foreign wages make investment more profitable. While higher foreign wages only has a demand effect, higher domestic wages also increase the costs of production. The net effect of increased domestic wages on the profit rate must be negative, because the fraction of wage income spent on industrial goods is less than one.

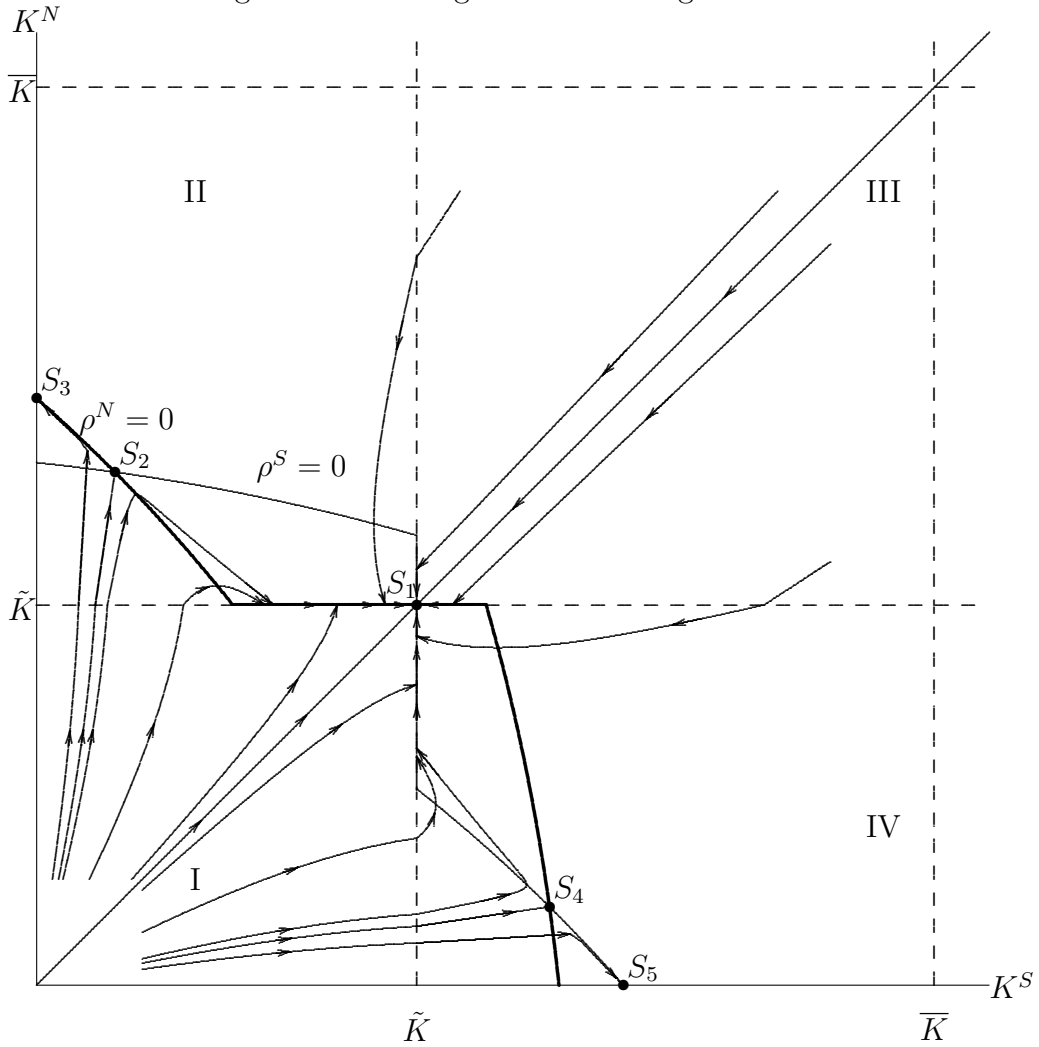
The arrows show the directions of the development of the capital stocks in the two regions. Below each zero profit line, the profit rate will be positive, leading to capital accumulation. As capital is accumulated, domestically or abroad, supply of

manufacturing goods is increasing, so the output price will be decreasing. A lower price makes investments less profitable, so the profit rate will be decreasing until it reaches zero at the zero profit line. Above each zero profit line, the output price will be so low that the profit rate will be negative, and the capital stock will be built down.

In figure 11, some integral curves are drawn. Along the diagonal, the two regions will have the same capital stock, and there will be no incentive for trading. Both regions will accumulate capital until they reach the equilibrium at S_1 . This equilibrium is the same as the equilibrium in figure 4. However, if one region at some point on the path along the diagonal to equilibrium S_1 accumulates a little more capital than the other, it will be more productive because of the external economies. This will lead to gains of trade. As the countries are trading, the more productive country will increase its manufacturing production and become even more productive. It follows that this region will have a higher profit rate, and will therefore grow faster. Nevertheless, when the capital stock in the leading region reaches \tilde{K} , there will be a drop in the profit rate, and we will end up in equilibrium S_1 . In contrast to the equilibrium along the diagonal in Krugman (1981), S_1 is a stable equilibrium. If one region has a little more capital than the other, it will be more productive. Nevertheless, the economies will move back to the autarky equilibrium. This is because the equilibrium is exactly at \tilde{K} , which means that the high-skill workers will grab all the gains from increased productivity.

The integral curves indicate that there are four more equilibria: S_2 , S_3 , S_4 and S_5 . While S_2 and S_4 are unstable equilibria, S_3 and S_5 are stable equilibria. In equilibrium S_2 and S_4 , both regions produce both goods. In S_2 , the North is partly specialised in industrial production, and exports manufactured goods to the South. Analogously, in S_4 , the South is partly specialised in industrial production. Theoretically, it is possible to end up in an unstable equilibrium by following the saddle path, however, a minimal amount of noise would lead to a development towards one of the stable equilibria. If we are to the left of the saddle path leading to equilibrium

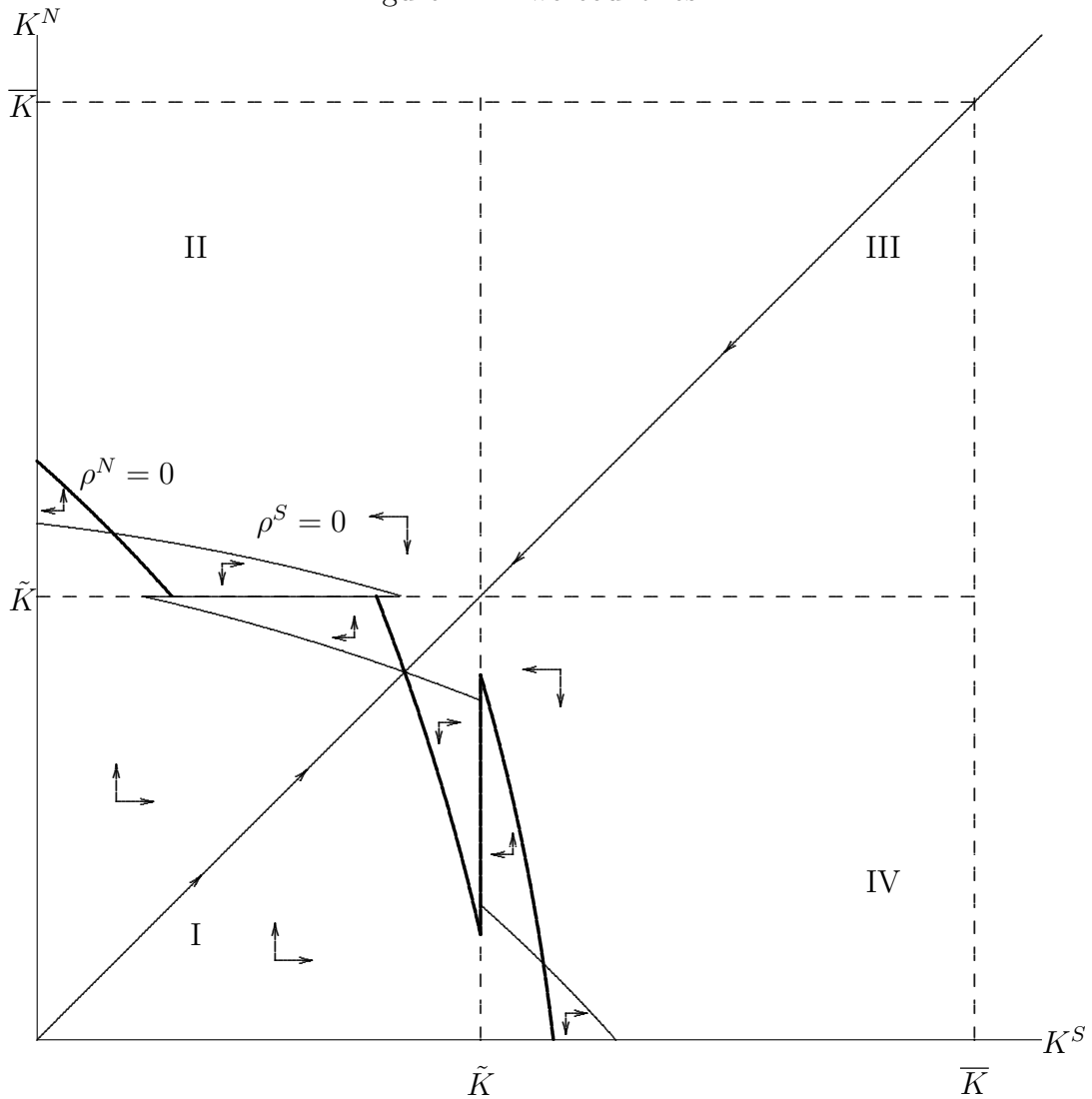
Figure 11: Two regions I with integral curves



S_2 , we will end up in the stable equilibrium S_3 . In this equilibrium, North has all the capital in the world. The South is completely specialised in agricultural production, and imports manufactured goods from the North. Analogously, if we are below the saddle path leading to equilibrium S_4 , we will end up in the stable equilibrium S_5 . In this equilibrium, the South is the industrial region, exporting industrial goods to the North.

Figure 10 and 11 represent the situation where the autarky equilibrium is where the capital stock in each region is equal to \tilde{K} , as in figure 4. This is true for a certain range of values on the parameters. If demand for industrial goods is low or the proportion of high-skill workers is high, the autarky equilibrium will be where the capital stock in each region is smaller than \tilde{K} , as in equilibrium S_2 in figure 5

Figure 12: Two countries II

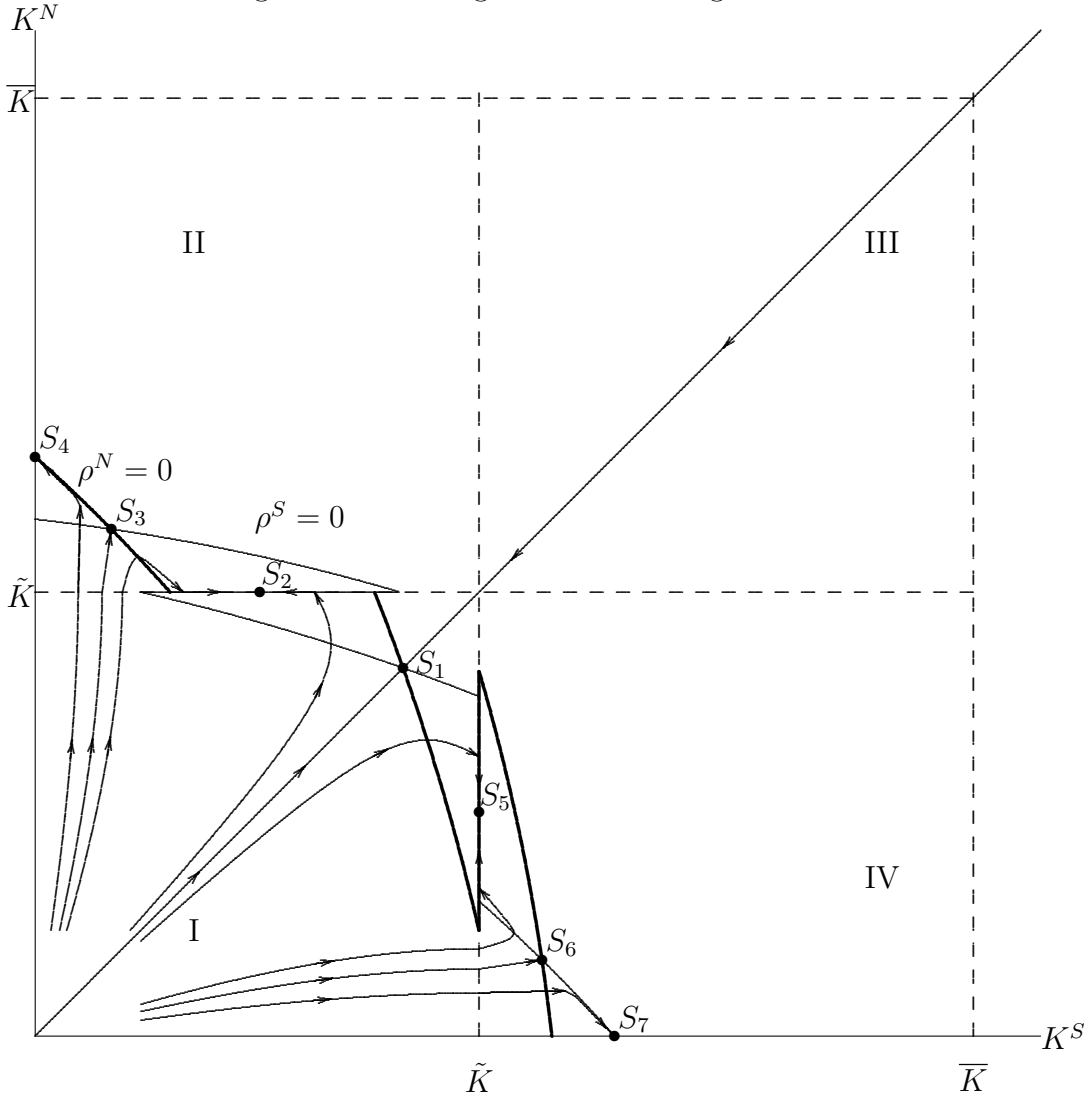


or figure 6. In this case, there will be a situation like that depicted in figure 12.

When the autarky equilibrium is not at $K^S = K^N = \tilde{K}$, there will be two shifts in the profit lines. Following the zero profit line of the North from $K^S = 0$, as the capital stock in the North reaches \tilde{K} , it shifts out. This is because the wage in the North falls. As the wage in the North falls, costs of production in the North go down, and the profit rate goes up. As it moves right, the capital stock in the South will reach \tilde{K} . At this point, the wage is increased in the South, so demand for industrial goods increases. This increases the profit rate in the North, so the zero profit line shifts out.

In figure 13, some integral curves are drawn. These indicate that there are

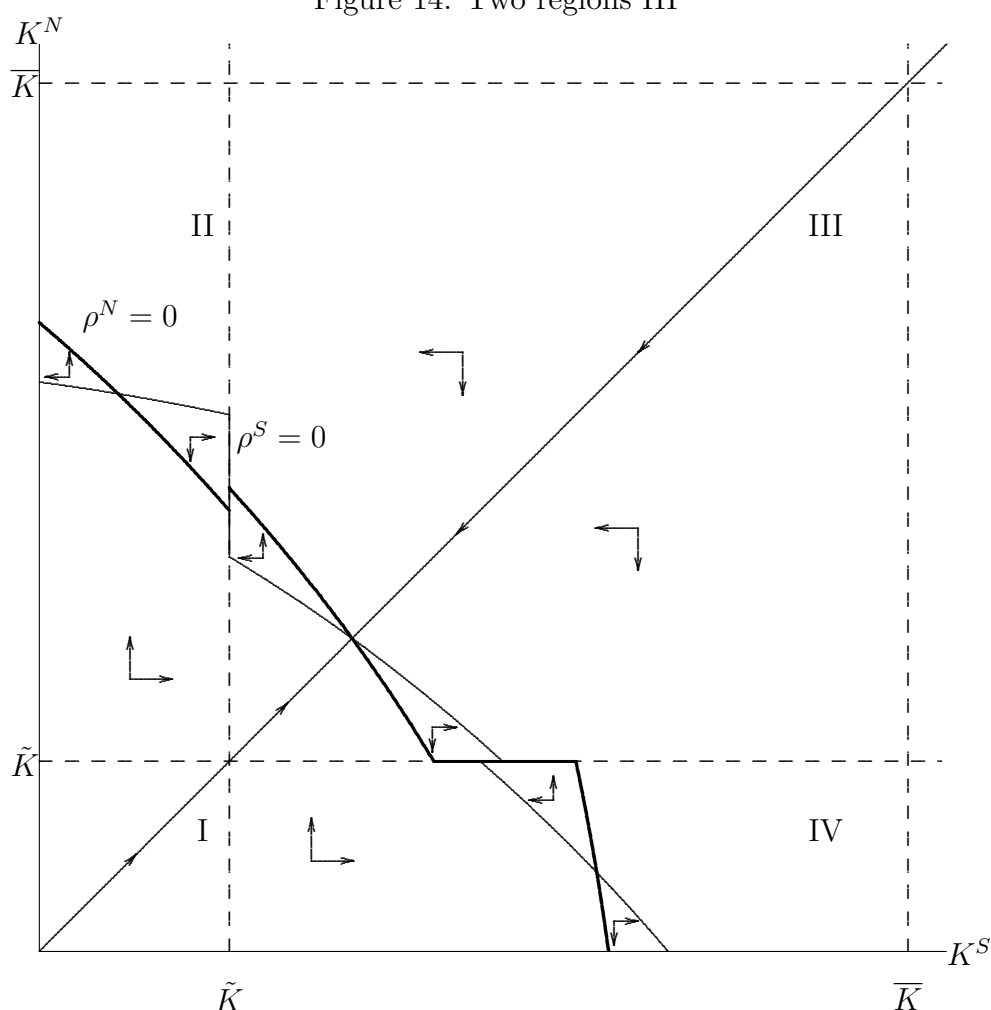
Figure 13: Two regions II with integral curves



seven equilibria: S_1 , S_2 , S_3 , S_4 , S_5 , S_6 and S_7 . While S_1 , S_3 and S_6 are unstable equilibrium, S_2 , S_4 , S_5 and S_7 are stable equilibria.

Along the diagonal, the two regions will have the same capital stock, and there will be no scope of trading. Both regions will accumulate capital until they reach equilibrium S_1 . In this equilibrium, both regions have high-skill workers employed in both sectors. However, in contrast to the situation in figure 11, this is not a stable equilibrium. As before, if the North has a little more capital than the South, the North will be more productive than the South, and grow at a higher rate. Following the solution curve to the left of the diagonal, as it crosses the zero profit line of the South, the profit rate in the South turns negative. It follows that the capital

Figure 14: Two regions III

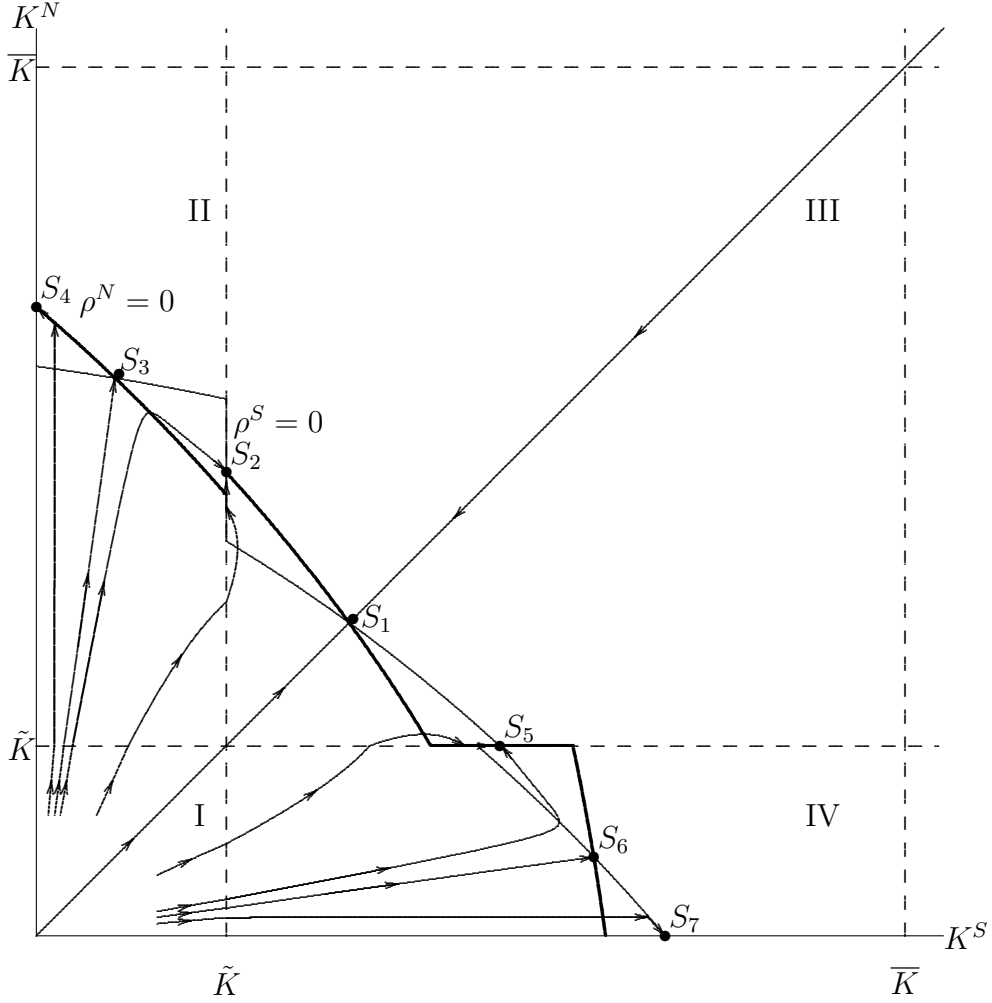


stock in the South will be decreasing. As the capital stock in the North reaches \tilde{K} , the wage in the North is bid up. Consequentially, the profit rate in the North goes down because of higher production costs, while the profit rate in the South goes up because of higher demand. The wage will settle at a level for which the profit rate in both regions is equal to zero. This point is equilibrium S_2 , where the economies settle. In this equilibrium, the North is partly specialised in industrial production, and exports industrial goods to the South.

If we start at a point to the right of the saddle path leading to S_3 , we will end up in S_2 , while if we start at a point to the left of the saddle path, we will end up in equilibrium S_4 . In S_4 , the North produces all the industrial goods and exports to the South, while the South is completely specialized in agriculture.

The reasoning for equilibrium S_5 and S_7 are analogous to that of equilibrium S_2

Figure 15: Two regions III with integral curves



and S_4 respectively.

Finally, I will look at a situation where the autarky equilibrium is where the capital stock in each region is larger than \tilde{K} , as equilibrium S_3 in figure 5 or figure 7. This is possible if demand for industrial goods is high, or the proportion of high-skill workers to low-skill workers is low. In this case, there will be a situation like that depicted in figure 14.

In figure 15, some integral curves are drawn. As in figure 13, there are seven equilibria: S_1 , S_2 , S_3 , S_4 , S_5 , S_6 and S_7 . While S_1 , S_3 and S_6 are unstable equilibria, S_2 , S_4 , S_5 and S_7 are stable equilibria. The reasoning for this is analogous to that of figure 13.

It is clear from the analysis above that in many cases, differing levels of the initial capital stocks will accumulate over time and lead to uneven development. In

the section below, I will explore the role coordinated wage bargaining can play in determining the development of the capital stock, and the economy as such.

6.3.1 Coordinated wage bargaining in a world of two regions

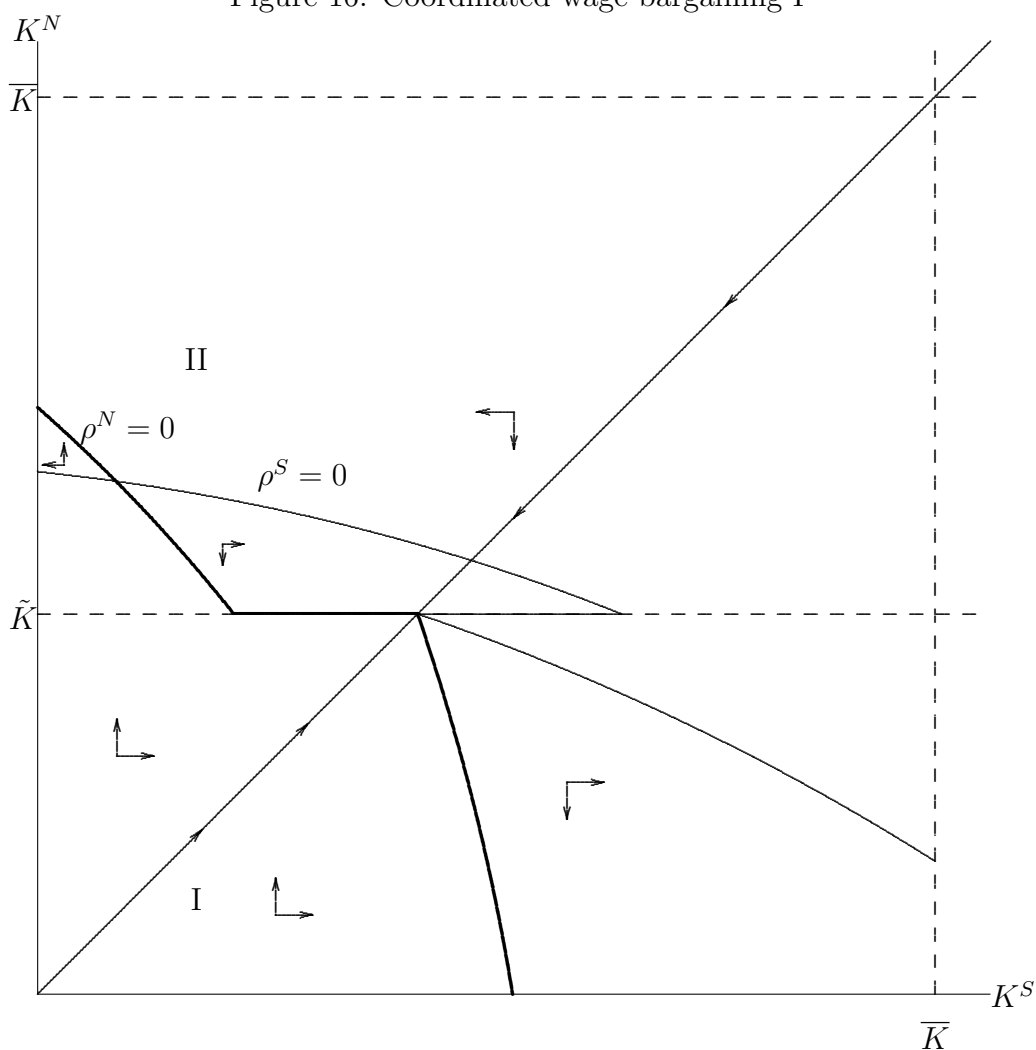
To make the idea clear of the potential benefits of coordinated wage bargaining in promoting development, I will study the case of full wage restraint, i.e. the educated workers agree not to demand higher wages when the last worker of this type is moved from the agricultural sector. I will start by studying how the situation will change in figure 11 when bargaining is coordinated.

When the workers in the South restrain from the wage increase as the capital stock reaches \tilde{K} , there will be a situation like that in figure 16. In this situation, the figure will be divided only into two areas, I and II. In area I, the capital stock in the North is smaller than \tilde{K} , while in area II it is larger than \tilde{K} . This means that the wage in the North is higher in area II than in area I. As the wage is not increased in the South, these will be only the two areas. It follows that the zero profit curves will shift as in figure 16 when the capital stock in the North reaches \tilde{K} . At this point, demand in both regions goes up and production costs in the North increase. This makes the profit line of the North shift in, while the profit line of the South shifts out.

In figure 17, some integral curves are drawn. These indicate four equilibriums. Equilibrium S_2 and S_3 are the same equilibria as in figure 11. S_2 is an unstable equilibrium, while S_3 is a stable equilibrium. Equilibrium S_1 is the autarky equilibrium, for the same levels of the capital stocks as before, however, this is no longer a stable equilibrium. Figure 17 indicates that all combinations of K^S and K^N to the right of the diagonal lead to equilibrium S_4 . This means that if the South has a little more capital than the North, the South will end up with all the capital in the world. In S_4 , the South is completely specialised in manufacturing production, while the North is completely specialised in agricultural production.

When it comes to the problem of getting on the good side of the diagonal,

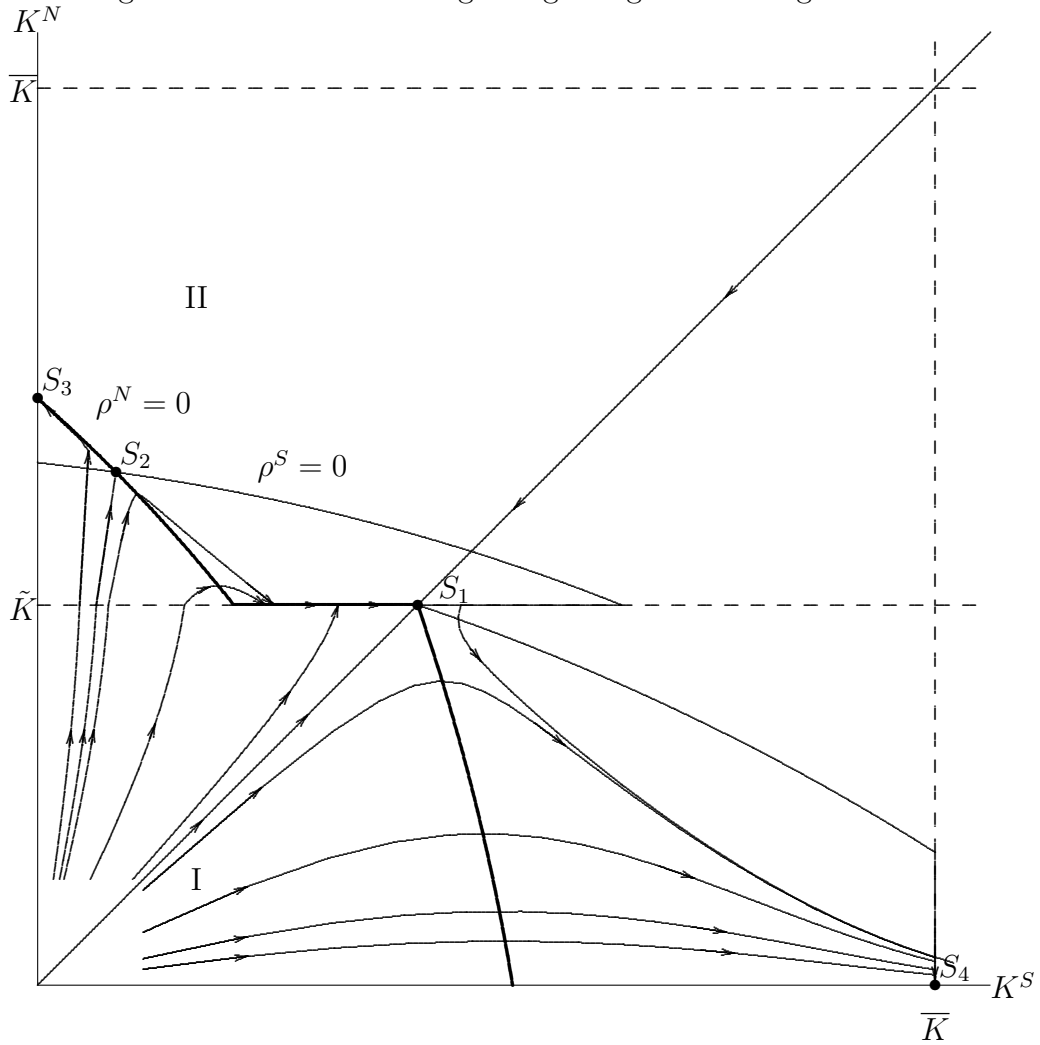
Figure 16: Coordinated wage bargaining I



coordinated wage bargaining can not alone secure this. All arrows to the left of the diagonal lead to one of the three equilibria S_1 , S_2 or S_3 . However, if the South has a little more capital than the North, and the workers in the South do not grab the gains of increased productivity by increasing the wage, the development will go towards equilibrium S_4 instead of equilibrium S_1 . This means that wage moderation can make it easier for other policy measures to succeed in getting on the good side of the diagonal. A small “push” is all that is needed. Without wage coordination, a small increase in the capital stock in one of the two regions would just lead to a development back to equilibrium S_1 , as in figure 11.

If the workers continue on full wage restraint until the capital stock reaches its maximum level, at this point, wages will increase until the profit rate goes to zero.

Figure 17: Coordinated wage bargaining I with integral curves

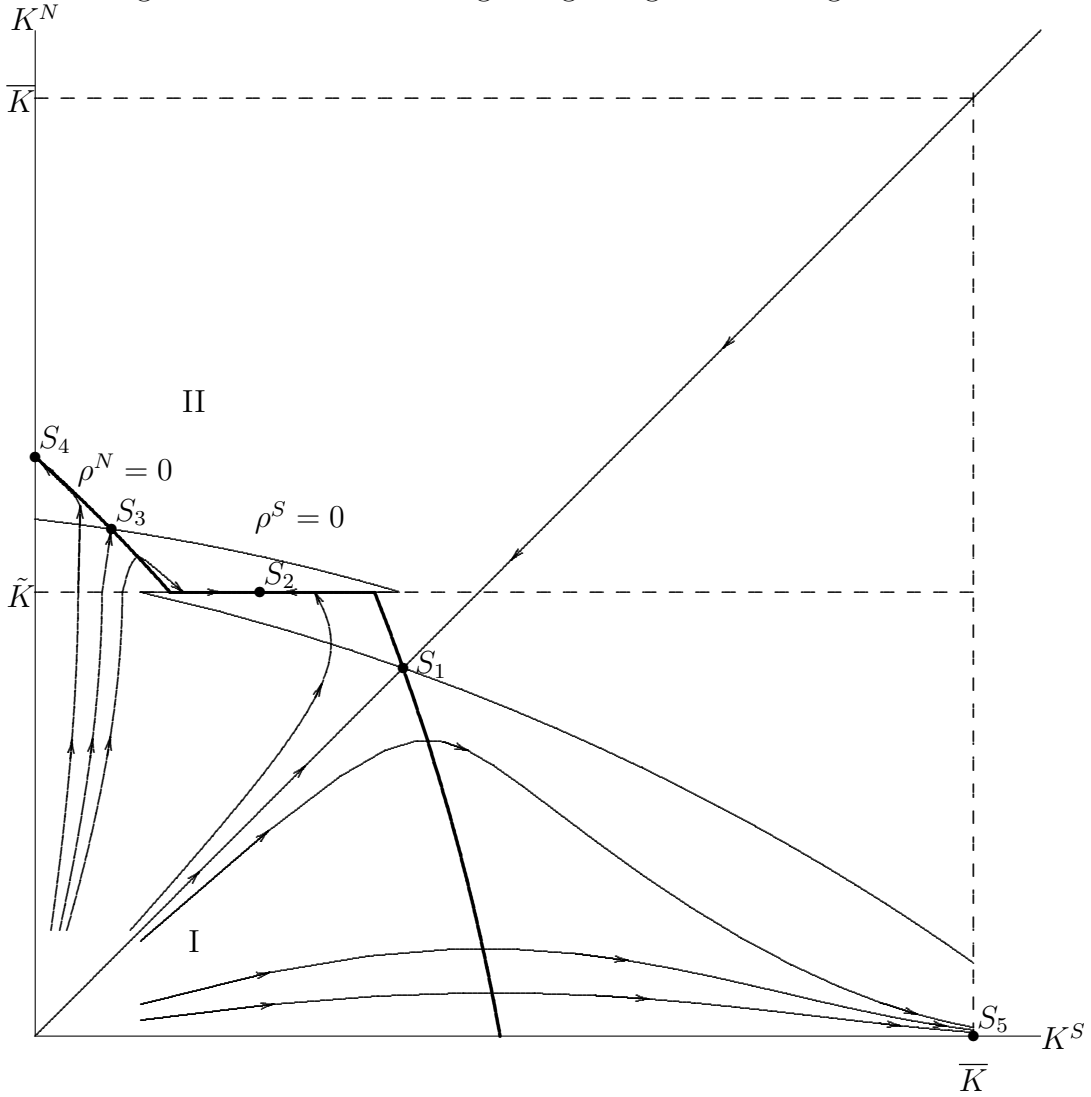


This wage development is one of many possible developments the educated workers could agree on; it is not necessarily optimal to go for full wage restraint until the capital stock reaches its maximum level. This, however, will give the highest profit rate in the South and so the fastest development. The optimal wage path will, as in the case in a small open economy, depend on the time preferences of the workers.

Figure 18 illustrates the result of full wage restraint in an economy depicted in figure 12 and figure 13. In this case, there are 5 equilibria. Equilibrium S_1 , S_2 , S_3 and S_4 are the same equilibria as in figure 13. As before, S_1 and S_3 are unstable equilibria, while S_2 and S_4 are stable equilibria.

When it comes to the problem of getting on the right side of the diagonal, wage coordination can not play an important role in this situation. In contrast to the

Figure 18: Coordinated wage bargaining II with integral curves

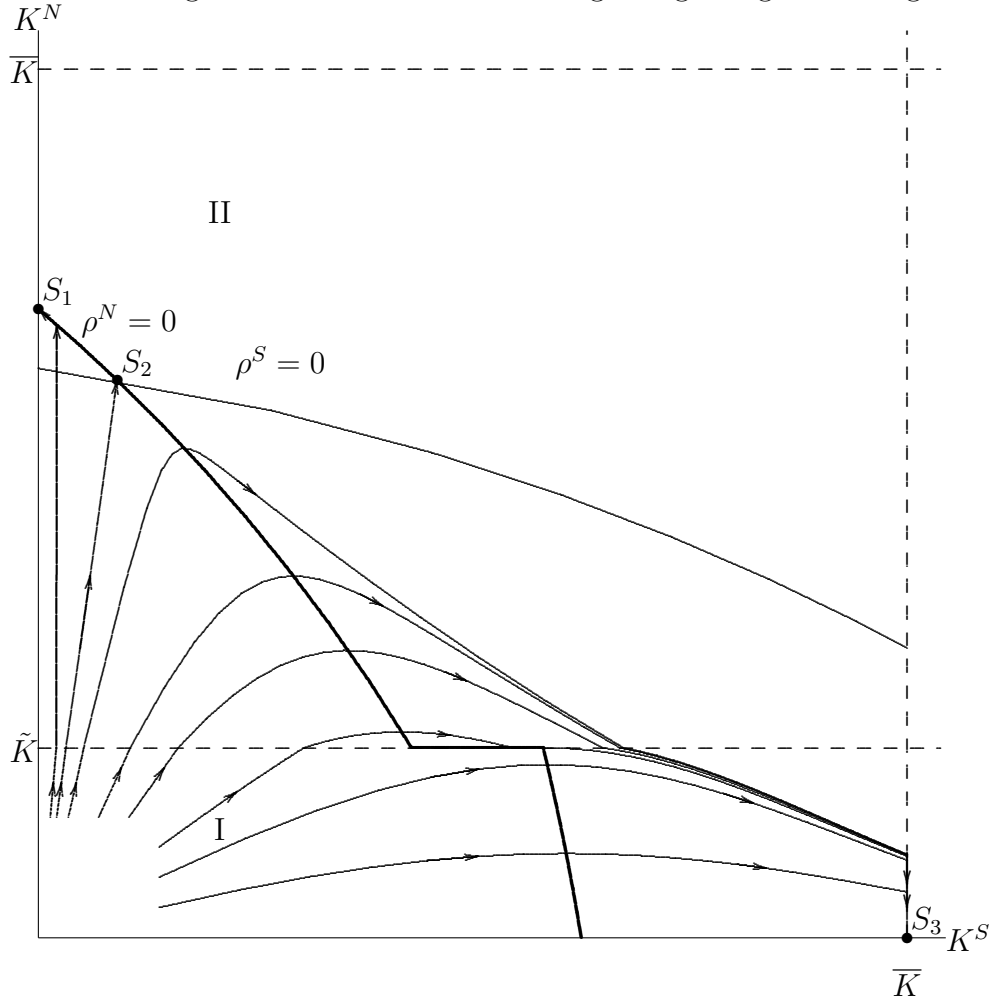


situation in figure 17, no integral curves on the left side of the diagonal lead to the autarky equilibrium. If the North has more capital than the South, there will be a development towards equilibrium S_2 , S_3 or S_4 . This means that wage moderation only has a scope in a situation where the South already has the lead in capital accumulation.

On the right side of the diagonal, all integral curves go towards equilibrium S_4 , where the capital stock in the South is at its maximum level, and all industrial production takes place in the South. At this point, wages will increase until the profit rate goes to zero.

As before, this wage path is not necessarily optimal. The educated workers can

Figure 19: Two regions III with coordinated wage bargaining with integral curves



increase their wages to k^S at an earlier point.

Finally, I will study the consequences of full wage restraint in the situation of figure 14 and 15. If the workers in the South agree on full wage restraint, the zero profit curves will look like those in figure 19. In this situation, there will be only three equilibria, S_1, S_2 and S_3 . Equilibrium S_1 and S_2 are the same as equilibrium S_4 and S_3 respectively in figure 15. It follows that S_1 is a stable equilibrium, while S_2 is an unstable equilibrium. Equilibrium S_3 is a stable equilibrium. All solution curves to the right of the saddle path go towards this point. This means that for all point to the right of the saddle path, the South can take the lead in capital accumulation by coordinating wage demands.

If the workers keep the wages down until the capital stock reaches its maximum level, the South will be completely specialised in manufacturing, while the North

will be completely specialised in agriculture. At this point, all wages will increase until the profit rate goes to zero. As before, the educated workers can choose to bid up the wage earlier.

7 Discussion

In this section I will discuss some of the main assumptions of the model.

7.1 Savings and investments

The model assumes capitalists to be pure saving machines. This is obviously not a realistic assumption. Capitalists also need money to live. However, if the capitalists spent a constant fraction of the rate of return on capital, this would not change the qualitative results in the model. Moreover, in the model, capitalists do not influence the productivity of the industry in any other manner than supplying capital. One can imagine that capitalists can improve efficiency in a firm by good leadership and organisation. If the capitalist cashed in the part of the profits that reflects these productivity improvements not accounted for in the model, it would not change the results. Nevertheless, this may be unrealistic. Capitalists may well increase the fraction of profits spent on consumption as the profit rate increases.

Nurkse (1952) stresses that the growing gaps in income levels between rich and poor countries, combined with increased awareness of these gaps, may tend to increase the propensity to consume in poor countries, and so reduce the ability to save and invest. This may be even more true today, as communication is better than before, and television and advertising are more prevalent. According to Nurkse: "The basic trouble is that the presence, or the mere knowledge of new goods and new methods of consumption tends to raise the general propensity to consume". Nurkse is inspired by the theory of interrelated consumption patterns. He emphasises what he calls the "demonstration effect". When people come into contact with superior patterns of consumption, their desires are increased, and so is their propensity to consume. Nurkse applies the theory to the international plane. He argues that there

is a tendency for potential investors in poor countries to look to the richer countries and copy their consumption patterns. In this way, savings go to luxury consumption rather than to investments. Myrdal (1957) also treats this problem, and suggests that luxury consumption should be restricted in order to secure domestic saving.

If the extra profit secured by wage moderation is not invested, wage moderation by the workers would have no real effect on the economic development. There would be distributional effects only, as capitalists consume what the workers restrained from consuming.

The assumption that all profits go to investments has another aspect: this is that the capitalists as a group would be better off by stopping the capital accumulation before the maximum level of the capital stock is reached. If they accumulate capital until this point, the workers will gain bargaining power and the wage will be increased until the profit rate goes to zero. The capitalists might foresee this and stop investing at an earlier point, in order to remain with a positive profit. This, however, would require that the capitalists organise and agree on this.

The model also assumes that there are no international capital and financial flows. Relaxing this assumption will open up for investment from abroad. In countries where supply of investments is low, this may encourage economic development. However, opening up for international capital and financial flows also means that domestic savings might go to investments abroad. To promote economic growth, a proper strategy would be to secure a high return on investment with the scope to attract foreign investment and to have the profits gained domestically invested in the country. The model presented above shows how coordinated bargaining through wage moderation can produce a higher return on capital and induce investment.

7.2 The coordination problem

In chapter 4, I discussed how external economies and increasing returns lead to multiple equilibriums, and that going from a bad equilibrium to a good one requires some sort of coordination of behavior. In the balanced growth argument, this co-

ordination is meant to take place between industries. Because of limited demand, one firm deciding to industrialise would not break even. If many firms industrialise at the same time, this would create its own demand and the investments would be profitable. This would require that firms come together and agree to industrialise simultaneously. A problem, however, is that firms would have incentives to break the agreement. Making the required investments includes a risk. Each firm would have incentives to wait and see if the "big push" succeeds in obtaining a positive rate of return on capital before they make their investments. Because these incentives exist, firms would expect other firms to break the agreement. If enough firms expect this, the expectations will become self-fulfilling and the "big push" will not occur.

In my model, the coordination takes place between the workers. By moderating their wage demands, the economy can end up in a Pareto-preferred equilibrium. In the "big push" model of Vishny et al. (1989), we could get the same result if the workers in the industrial sector would accept a lower wage premium. However, wage moderation also comes with a "free-rider" problem. I will come back to this in section 7.3.2.

7.3 Collective wage bargaining

7.3.1 Desirability of collective wage bargaining

The desirability of collective wage bargaining has been highly debated. From a neoclassical standpoint labour unions disturb free competition in the labour market and so reduce economic efficiency. According to the corporatist approach, on the other hand, collective wage bargaining is preferred over free competition because it internalises the external effects of wage setting (Rama 1994). The desirability of collective wage bargaining will depend on the particular wage development that is agreed on. This in turn will depend on the way the bargaining is organised: who the different parts are in the bargaining, what their goals are and what their relative bargaining power is.

The organisation of wage bargaining can be characterised by two aspects: the

union density and the level at which bargaining takes place. The union density influences the bargaining power of the unions in the determination of wages, because unions with only a few members in an industry cannot ask for high wages without putting its members in a disadvantaged position in the labour market. Industries with a high union density, on the other hand, have the possibility of demanding high wages (Aidt and Tzannatos 2002).

The level at which collective wage bargaining takes place, affects how employers and employees interact. Collective bargaining can take place at the firm level, the industry level and the national level. When labour unions bargain on the firm level they will not be concerned with the external effects of wage setting. This is because the adverse effects on the price level, the profit rate and the employment rate in the economy when wages are increased will not outweigh the private gains of a higher wage. In firms where profits are high, bargaining on the firm level combined with high union density in the firm will consequentially lead to high wages. In firms where profits are low, demanding high wages will not be as attractive, as the firm will have to respond by cutting the workforce. It follows that there will be high wage differentials between firms (Barth et al. 2003).

When unions bargain at the industry level the members represent a particular occupation. By uniting, they will avoid competing for supplying the cheapest labour. This means that they will be in a stronger position against the employers than bargaining at the firm level would imply. In a closed economy wage demands can be passed on to consumers in the form of higher prices. If the industry is not sufficiently large, external effects of the wage setting will not be internalised (Barth et al. 2003). If the members represent an occupation that is crucial for the production and profits are high, they can demand high wages. In an open economy, however, this will be harder as prices are in a higher degree determined in the world market. This means that the bargaining power of labour unions will be reduced, and wages will be lower (Rama 1994).

When bargaining takes place at the national level (highly centralised bargaining),

the members of the union federation will represent different occupations. This means that higher wage demands from one group of workers will have adverse effects on other groups. Moreover, the labour movement will be big enough to internalise the external effects of the wage setting. This leads to wage moderation to obtain a high real wage combined with a high employment level (Barth et al. 2003).

In the model presented above, it is assumed that all high-skill workers unite and agree on a common wage demand. This organisation of bargaining may be characterised as industry level bargaining. The union will have monopoly on high-skill labour, which gives them strong bargaining power.

If investments were exogenous, this would lead to higher wage demands, according to the discussion above. However, high wage demands will have adverse effects on the profitability of investments. The rate of investments will in turn have effects on future real wages and the employment level in the industrial sector. In the model, there is no unemployment. However, the workers risk having to move back to the agricultural sector if profits in the industrial sector are too low. The union will have to take this risk into account when bargaining wages.

When it comes to future wage prospects, the analysis above has shown that the high-skill workers are better off moderating their wage demands as the last high-skill worker is taken from the agricultural sector. This will increase the rate of investments, and so the capital stock will grow. As the capital stock grows the productivity of the high skill workers increases relative to the low-skill workers. This means that the high-skill workers may demand a higher wage than what was possible before. Moreover, a higher capital stock is accompanied by a higher industrial production, and so a lower price on manufactured goods.

In conclusion, all workers in the model are better off when wage bargaining is coordinated as outlined above. The real wage of low-skill workers will increase because the price on industrial goods is reduced. The high-skill workers will get a higher nominal wage in addition. As capitalists are treated as pure saving machines in the model, they will not be better or worse off in any case. However, if we

assume that capitalists spend a constant fraction of the rate of return of capital on consumption, the increase in the capital stock will make them better off. As all groups are better off, coordinated wage bargaining is a desirable arrangement in the model.

7.3.2 Feasibility of coordinated wage bargaining

The feasibility of coordinated wage bargaining depends on the willingness of employees and employers to take part in the negotiations. This in turn depends among other things on whether all parts are better off with coordinated wage bargaining compared to the alternatives. From the above discussion, it is clear that the workers with education, as a group, are better off coordinating their wage demands, as long as the capitalists invest the profits. It is also a fair assumption that employers will be willing to negotiate centrally if this leads to wage moderation.

The problem is whether each educated worker has incentives to become (or stay) a member of the union. If the union decide that they are better off as a group by moderating their wage demands temporarily, the individual worker would be better off breaking out of the union and bargain his wage individually. If all other workers moderate their wage demands, a free-rider would be able to demand a wage equal to his marginal product. If the workers expect others to break out of the negotiations, the expectations would become self-fulfilling, and the economy would be stuck in a low-level equilibrium.

The incentives a worker has to break out of the union in this case are stronger than the incentives each firm has to break the agreement of simultaneous industrialisation discussed in section 7.2. The free-rider problem in the “big push” argument only occurs if the firms expect others to break the agreement. In the “big push” model, as investing alone would give a loss, each firm will invest only if it believes that others will invest. If the firm fears that other firms will not invest because of this risk, it will be better off postponing the investment a year or so to see if the investments become profitable.

When coordination takes place as collective wage bargaining, on the other hand, there is a free-rider problem especially when each worker expects other workers to follow the agreement. If the individual worker expects many to stay and carry out the wage moderation, he might as well break out of the union and demand a higher wage. This would have an imperceptible effect on the profitability of investments.

However, there is another aspect of collective wage bargaining that I have ignored until now. Employers may also associate in a federation. If they do, they will reduce the competition for labour, and be able to lower the wages. Since all educated workers are the same, there will be no incentives to break out of the federation and offer high wages in order to attract the best workers.

In reality, workers will be different, and so these incentives will be present. Moreover, some firms will have higher profits than others. In these firms, the workers may demand extra high wages, and so it will be extra tempting to break out of the union. For the capitalist, it may be tempting to give in for the demands to avoid a costly conflict.

If the capitalist gives in, and the workers succeed in obtaining higher wages, other workers will find it less attractive to moderate their wage demands, and the union might break. If employers are associated, they can pressure the capitalists not to give in. As they risk higher wage demands everywhere, it might even be optimal to support the capitalist financially while the conflict is going.

As the association of employers and the unionised workers have a common interest in securing the agreement on wage moderation, potential free-riders will be pressured to follow the agreement.

8 Conclusion

In this thesis, I have presented a simple model, based on Krugman (1981), where gains of trade are attributed to increasing returns in the manufacturing sector due to external economies. I have extended Krugman's model by introducing two types of labour. The development of wages is simple in the absence of coordination. The

wages are equal for all until there is shortage of the skilled workers that are the most productive in the manufacturing sector. At this point, the skilled workers use their monopoly power to demand high wages.

I have studied possible development paths and equilibria in the model, in three different contexts: a closed economy, a small open economy, and a world of two regions trading. In a closed economy there will be a unique and stable equilibrium, thus, there will be no scope in coordinating wage demands. A small open economy in Krugman's model would also have a unique and stable equilibrium. However, the introduction of different labour types leads to multiple equilibrium. The literature on balanced growth has shown that when there are multiple equilibria, an economy can move from a bad equilibrium to a good one by coordinating behaviour. I have shown that coordinated wage bargaining can play this role. If the workers restrain from wage increases for a period of time, the economy can end up in a better equilibrium, where wages will be higher.

In Krugman's model of a world of two regions, there are three equilibria. One unstable autarky equilibrium, and two stable equilibria, where one of the two regions has taken over all industrial production. When there are two different labour types the outcome is not that clear. The characteristics of the equilibria will depend on the particular spending patterns of consumers and the relative supply of the two labor types. For a certain range of values on these parameters, the autarky equilibrium will be exactly at the point where all the high-skill workers are employed in the industrial sector, and all the low-skill workers are employed in the agricultural sector. In contrast to Krugman (1981), this will be a stable equilibrium, because the high-skill workers will grab all productivity increases by using their monopoly power to demand higher wages. For other spending patterns and relative supply of labour, the autarky equilibrium will be unstable, as in Krugman's model. When demand for industrial goods is low or the proportion of high-skill workers to low-skill workers is high, the autarky equilibrium will be at a point where there are still high-skill workers in the agricultural sector. On the other hand, when demand for industrial

goods is high or the proportion of high-skill workers to low-skill workers is low, the autarky equilibrium will be at a point where both high-skill workers and low-skill workers are employed in the industrial sector.

The placement and characteristics of the equilibria will determine the scope of coordinated wage bargaining. When demand for industrial goods is high or the proportion of high-skill workers to low-skill workers is low, coordinated wage bargaining can play an important role in determining the development path. In this case, the region lagging behind in the accumulation of capital can actually take over all industrial production by temporarily moderating wage demands. In the situation where demand for industrial goods is low or the proportion of high-skill workers to low-skill workers is high, coordinated wage bargaining can not play the role of getting an edge. However, the region that already has the lead will be able to get to the best out of two stable equilibria by coordinating wage demands. Finally, when the autarky equilibrium is where all the high-skill workers are employed in the industrial sector, and all the low-skill workers are employed in the agricultural sector, coordination of wage bargaining may not alone secure that the lagging region succeed in taking the lead. However, wage moderation may play an important role in this by allowing a coordination of investments by capitalists to succeed in this. In many cases, when workers restrain temporarily from a wage increase, very little investment is needed to obtain a positive profit rate and take over all industrial production.

This thesis has shown that coordinated wage bargaining might play an important role in creating economic development in an open economy. It is interesting, however, that the gains of coordinated wage bargaining depend on the different characteristics of the economies in question. This might explain why coordinated wage bargaining has played a positive role in creating economic development in some countries, while in others it has not succeeded in this.

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