A Story of Trade-Induced Industrialization

by

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Preliminary Draft
June, 2009

Abstract

We offer a simple variant of the standard Heckscher-Ohlin Model that explains how a developing country, by opening to trade with a large capital-abundant economy, can be induced to shift resources into more capital-intensive production than what it was producing in autarky. As a result it experiences a rise in its return to capital and, if capital is internationally mobile, both an increase in its capital stock and an increase in trade. These results arise in a model in which both a traditional and a modern sector can produce final goods that are perfect substitutes. The modern sector uses intermediate inputs that differ in their relative capital intensities, while being both more capital intensive than the traditional sector. The results of this model accord well with the experience of the Asian Tiger economies during the early decades of their export-oriented industrialization.

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1. Introduction

We develop a simple model of trade between a developing country and a developed one where their trade can induce the developing country's "industrialization" of creating or expanding a manufacturing sector. We modify the standard Heckscher-Ohlin model in two ways. First, a *modern* (manufactured) good requires two intermediate inputs for its production with one intermediate input being more capital intensive than the other and both intermediate inputs being more capital intensive than a *traditional* good. Second, we assume that consumers perceive the modern good as a perfect substitute for the traditional one.[1]

This modified Heckscher-Ohlin model then generates a number of unconventional results. First, the developing country will trade with the developed country only when its endowment of capital per labor is higher than a critical level. It then imports the capital-intensive intermediate input in exchange for exporting the labor-intensive intermediate input.[2] The importation

[1] We assume that one unit of the modern good is a perfect substitute for one unit of the traditional good, but it could just as easily be a perfect substitute for more than one unit of the latter, to reflect difference in quality. The assumption of perfect substitution, however, is needed to keep the exposition of the model simple.
[2] Alternatively, the developing country may also, or instead, import the modern final good in exchange for exporting the labor-intensive intermediate input. Regardless of these different forms of trade that may arise between the countries, in terms of the factor content of trade, the developing country ends up importing the services of capital from the developed country in

of the capital intensive-intermediate input allows the developing country to produce the modern good at a cost lower than its autarky cost, facilitating its creation or expansion of a modern sector, which we denote as *trade-induced industrialization.* Second, such trade will raise the return to the capital in the developing country when it produces both the traditional good and the labor intensive-intermediate input, despite the fact that it is indirectly importing capital and exporting labor through its trade with the developed country. Finally, an increase in the relative capital endowment of the developing country, which may arise either through its own capital accumulation or through inflow of foreign capital, will accompany an expansion of trade as long as its relative price of capital is still higher than that of the developed country.

Our model is useful in explaining the experiences of developing countries that have pursued an export-oriented industrialization strategy, such as Hong Kong, Singapore, South Korea, and Taiwan in the 1960s and 1970s, and more recently China in the 1980s and 1990s. These countries have attained a rapid expansion of their manufacturing sector with a large portion of its output being exported to developed countries. In addition to sharing this experience of creating a heavily export-oriented manufacturing sector, these developing countries also share the following economic profiles in their industrialization process: a rapid expansion of imports of intermediate inputs from developed countries; a high return to capital sustained for an extended period of time; an expansion of international trade, both in its absolute value and in its ratio to the size of the economy, accompanying a rise in the capital-labor ratio.[3] These profiles of

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exchange for exporting the services of labor embodied in the labor-intensive intermediate input.
[3] Section 4 provides a detailed discussion of these characteristics of trade-induced industrialization

industrialization correspond well with our model's implication for a developing country's trade-induced industrialization.

There exist other works that are related to ours. Davis (1996) has demonstrated that a developing country's trade liberalization may induce a rise in the return to capital even when it is a labor abundant country relative to the rest of the world. In a two-factor three-final-good version of a Heckscher-Ohlin model with many countries, a globally labor abundant country (producing only the two most labor-intensive goods) can be locally capital abundant in the sense that it imports the most labor intensive good from a more labor abundant country. Trade liberalization by such a developing country raises the return to capital because its import expansion of the most labor-intensive good induces its resources to move away from the production of this most labor-intensive good, thus generating a higher demand for capital. This contrasts with our model where a rise in the return to capital in association with trade liberalization of a developing country will only accompany an import expansion of the most capital-intensive intermediate input from the developed country.

Likewise, Feenstra and Hanson (1996) present a model of outsourcing in which wages rise in both countries for reasons similar to what happens here. Deardorff (1986) is also related to our model in the sense that he shows how preferences can interact with factor intensities to create a situation in which factor prices move further apart with trade, the return to capital in a capital-scarce country rising instead of falling. While Markusen (1983) and more recently Antras and Caballero (forthcoming) develop models of trade

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of developing countries that have pursued the export-oriented industrialization strategy.

demonstrating complementarity between trade and capital mobility, their models are different from ours in the sense that the difference in relative factor endowments across countries is not the primary cause for trade in their models.

The rest of the paper proceeds as follows. Section 2 explains the basic setup of our model, characterizing its autarky equilibrium. Section 3 demonstrates how trade can induce industrialization of a developing country in the presence of a large developed country, focusing on the model's unconventional results. In connection with these results, Section 4 discusses the experiences of developing countries that have pursued the export-oriented industrialization strategy. Section 5 then concludes with a brief discussion of possible future work based on our model of trade-induced industrialization.

2. Basic Setup and Autarky Equilibrium

Consider a world in which there are two types of industries, a *traditional* industry and a *modern* industry. The traditional industry produces good X and the modern one produces good Y. They are perfect substitutes in demand, but they are produced using capital and labor subject to different technologies. [4] Good X is the more labor intensive. Good Y is assembled costlessly from two intermediate inputs, M and N, which differ in capital intensity and are both more capital intensive than X.

In autarky, none of these goods are traded, and the technologies of M and N can be combined to imply a single technology for good Y. Since X and Y

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[4] One may model good Y of the modern sector to be a superior substitute for the traditional good X, consumers having the utility function, $u(x, y) = x + \lambda y$ with $\lambda > 1$ and lower case letters representing the amounts of consumption of the corresponding goods. Assuming $\lambda > 1$ (or even $\lambda < 1$) instead of $\lambda = 1$, however, does not affect the qualitative results of the following analysis. For simplicity of exposition, we assume that $\lambda = 1$.

are perfect substitutes, their prices must be the same if both are produced and consumed. The autarky equilibria are fully described by Figure 1, in which the solid curves show unit (and hence unit-value) isoquants for X and Y. As shown in Figure 1, there is a unique common tangent line to the unit-value isoquants for X and Y, creating two tangency points. Denote the capital-labor ratios defined by these tangency points on the X and Y isoquants by k_x and k_y respectively.

As is usual in the familiar Lerner Diagram, a country with factor endowment such as point E_2, which lies between the rays k_X and k_Y of the common tangencies to the two isoquants, will produce both goods. It will have factor prices w_2 and r_2 given by the (reciprocals of) the intercepts of the tangent line. It will produce more of good Y, and less of good X, the closer is the endowment point to ray k_Y.

Production of good Y actually requires production of the intermediate goods, M and N, whose unit value isoquants at the prices p_{M2} and p_{N2} corresponding to factor prices w_2 and r_2, are shown as dashed curves in Figure 1. The isoquant for good Y is a weighted average of these two isoquants, which must therefore lie on opposite sides of it. Nothing in the construction so far requires that good M be more capital-intensive than good X, although that will become important later in the story.

A country that is less well endowed with capital than ray k_X, such as at point E_3, will produce only the more labor-intensive good X. Its factor prices (not shown in Figure 1) will be given by a line tangent to the X isoquant at the capital-labor ratio of its endowment, thus a lower wage than w_2 and a

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higher rental than r_2.

A country that is endowed with more capital per worker than k_Y will similarly specialize, this time in good Y. This is shown in Figure 2, where the country's wage, w_1 is higher, and its rental on capital r_1 is lower, than would have been needed to produce both goods. Instead, the country produces none of good X, since at these factor prices good X would cost more than it would be worth to consumers.

Production of good Y in autarky requires production of both intermediates, M and N, whose prices must therefore also adjust to accommodate the different factor prices. The unit-value isoquants for these goods that achieve this are shown in Figure 2. Comparing to the gray image of the isocost line from Figure 1, which was tangent to the two unit-value isoquants in Figure 1, it can be seen that the price of M is higher and the price of N is lower than was the case in Figure 1.

Thus, depending on the capital-labor ratio of its endowment, denoted by k, a country under autarky belongs to one of three distinct development stages in terms of its industry composition:

Proposition 1. Under autarky

i) if $k < k_x$, a country will produce and consume only good X, with the return to capital (labor) falling (rising) in response to an increase in k;

ii) if $k_x \le k \le k_y$, a country will produce and consume both goods X and Y, with the return to capital (labor) being fixed in response to an increase in k; and

iii) if $k > k_y$, a country will produce and consume only good Y, with the return

to capital (labor) falling (rising) in response to an increase in k.

Creation or an expansion of a modern sector producing good Y, namely "industrialization," will not occur unless a country is endowed with enough capital. Once a country starts to produce good Y as well as good X with $k \geq k_x$, then the prices of both factors and intermediate goods at first remain fixed as the country becomes more well-endowed with capital. But once a country completes its industrialization, specializing completely in the more capital-intensive suite of technologies, additional capital abundance raises the wage, pushes down the price of capital, and causes more capital-intensive intermediates to fall in price while more labor-intensive intermediates rise in price.

3. Trade-induced Industrialization: the Case of Small Developing Countries

Consider now a free-trade world in which a very large capital abundant country with its $k > k_y$ (Country 1), like the one in Figure 2, trades with other countries that are, collectively, too small to influence world prices. With the exception of good X, which is not produced in the large country, the prices prevailing under free trade are the ones underlying the black unit-value isoquants in Figure 2. The price of good X, if it is to be consumed anywhere under free trade, must be the same as good Y, since X and Y are perfect substitutes. Thus the relevant unit-value isoquants for the small countries are those shown in Figure 3, the convex hull of which therefore provides the full menu of options

for countries of various capital-labor endowments to produce a unit of value.

Figure 3 emphasizes the unit-value isoquants of the two most labor-intensive options for such a country, since these will be relevant for the poorest countries. Thus it shows, in black, the isoquants for X and M and the common tangent between them. We denote the capital-labor ratios defined by the tangency points on the M and X isoquants by $k^/_M$ and $k^/_X$ respectively. The return to capital if both are produced is the inverse of the vertical intercept of the common tangent line, denoted by $r^/_X$. From these we can describe what a relatively labor-abundant country will do as a result of free trade.

Countries whose capital-labor endowment ratios are below that of the new ray k'_X, such as E_5 in Figure 3, will do nothing. In autarky they were producing only the traditional good X, and they continue to do so with free trade, since their factor prices, given by a tangent to the X-isoquant at their factor ratio, make even good M too costly to produce. They therefore do not trade. It is true that they could, in principle, export good X in exchange for good Y, since the two are perfect substitutes and have the same price in both countries, but nobody gains from such a trade and we exclude it.[5]

Countries that have factor endowments like E_4 in Figure 3, which place them between k'_X and k_X are more interesting. Prior to trade they produced only good X. But with trade their factor prices make them competitive in producing the intermediate good M, and they therefore reallocate some of their labor and more of their capital to producing it. Thus they begin to "industrialize" as a result of trade. Good M is of no direct use to them by

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[5] This could be justified by the introduction of an infinitesimally small iceberg transportation cost.

itself, however, so they must export it, in exchange either for good Y or for the other intermediate good with which they can produce good Y. They can also export good Y in exchange for good N because they can combine imported good N with domestically made good M to produce and export good Y.[6] The exact pattern of production and trade is here indeterminate, as is often the case when more goods than factors have the same cost.

This trade-induced industrialization arises because trade enables such countries to obtain good Y at a cost lower than their autarky cost. Under free trade, they can obtain a unit value of good Y using any combination of labor and capital on the isoquant for M instead of the ones on the isoquant for Y in Figure 3. This implies that they can obtain the same unit of Y using less capital and less labor, thus at a lower cost under free trade than under autarky. Whichever pattern of production and trade that they end up taking, in essence, they obtain the capital-intensive intermediate input N necessary for the production of good Y at the lower cost by producing extra units of good M and exchanging it for good N (or indirectly conducting such an exchange of intermediate inputs in terms of factor content of trade) in the world market.[7]

Note, too, that this move to free trade by the poor country has caused its

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[6] Again, however, an infinitesimal transport cost for all goods would preclude this unnecessary trade.

[7] There is one more way of obtaining good N for the production of good Y at the same lower cost: they can produce extra units of good X beyond what is necessary for their domestic consumption and exchange it for good N (first by exporting good X in exchange with good Y, then exchanging good Y for good N). Producing one unit of good Y using the imported good N obtained by exporting good X will require a combination of labor and capital that is in the middle of the X and M isoquants in Figure 3 and on the tangent line common to these two isoquants. Denote such a combination of labor and capital by (L_{XN}, K_{XN}). Note that it is a more labor-intensive way to produce one unit of good Y than exporting good M in exchange for good N. While exporting good X in exchange for good N may replace exporting good M in exchange for good N, the latter form of trade should occur (at least be a part of trade) if $k > K_{XN}/L_{XN}$ in order to satisfy the full employment condition. We thank Gene Grossman for mentioning this alternative way to obtain good N for the developing countries.

wage of labor to fall and its rental on capital to rise, contrary to what one would normally expect from the Stolper-Samuelson Theorem when a labor-abundant country opens to trade.

Similar results obtain for a country that has somewhat more capital, so that in autarky it did produce at least a little of goods M, N, and Y. Such a country, with endowment E_3 in Figure 3, will cease production of the most capital-intensive intermediate input N when it opens to trade, reallocate factors from both goods N and X to good M, and export good M in exchange either for good N or good Y. Thus such a country was already somewhat industrialized in autarky, since it produced both goods M and N, but it now specializes more in the single intermediate good that it can produce more efficiently. And again, the factor prices change against labor and in favor of capital with the move to free trade.

These factor-price changes contradict the Stolper-Samuelson Theorem only in what the Theorem says about scarce and abundant factors. In its essential version,[8] the theorem merely says that relative price changes favor the factor used intensively in the sector whose price rises and hurt the other factor. Both of these are very much the case here. The reason that the labor-abundant country shifts into producing good M in this case is that good M has a *higher* price relative to good Y, and therefore good X, in the large country than what prevailed in autarky in a small country. This, in turn, was because of the relatively high wage in the large country, which made the labor-intensive intermediate input more costly there. Thus the factor price changes in the small

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[8] See Deardorff (1994).

country here are exactly what one would expect from the Stolper-Samuelson theorem for a rise in the price of the (within the poor country) capital-intensive good M.

This and other effects on factor prices, as well as specialization, for small countries of a variety of factor abundances, are shown in Figure 4. This is largely the same as Figure 3, except that different curves are emphasized and their proportions have been changed somewhat for ease of viewing. The gray curve and gray lines show the Y isoquant and the associated autarky factor prices and proportions. The black curves and lines show the unit-value isoquants for goods X, M, and N as determined in the large (therefore autarkic) country. A small country of any factor endowment can be placed into this figure and it will operate on the convex hull of these three isoquants, producing either a single good if it is on an isoquant itself, or producing a mix of two goods if it is on the straight line tangent to two of them. Factor prices are determined by the slope and intercepts of a line tangent to the hull at the point of operation. We denote the capital-labor ratios defined by the tangency points on the large country's autarkic isoquants for M and N by $k_M^{//}$ and $k_N^{//}$ respectively, and the level of the return to capital defined by the inverse of the vertical intercept of the common tangent line by $r_N^{/}$.

Clearly, and as is common in a multi-good, multi-cone Heckscher-Ohlin model, countries of different factor endowments specialize differently as they climb the ladder of relative capital abundance: They produce first only good X, then goods X and M, then only good M, then M and N (and/or perhaps Y),

and finally only good N.

The path of factor prices is also evident, the wage-rental ratio either falling along isoquants or remaining fixed along their tangents as capital abundance increases. More interesting, however, is how the factor prices compare to what they would have been in autarky. This can also be read from the gray curves and lines in Figure 4. Figure 5, however, shows the results for the rental price of capital as it varies with the ratio of capital to labor in the small country, both closed (shown in gray) and open (shown in black).

The four smooth downward sloping curves in Figure 5 show the rental along each of the unit-value isoquants for goods X, M, Y, and N. Portions of these curves also appear on the curves for autarky and free trade equilibria when these equilibria are specialized in just one of those goods. For other endowment ratios k, however, the small country produces two of the goods and occupies a position along a horizontal segment that extends between two curves.

The lesson from Figure 5 – which could also be seen in Figure 4 but may be more evident here – is that there exists a range of rather low (in terms of capital) endowment ratios for the small country at which the move from autarky to free trade causes the rental to rise, as well another range for which the rental falls. Perhaps surprisingly, given the normal expectation that capital is dear in poor countries, the former range appears at lower capital abundance than the latter.

Thus it is quite plausible in this model that a poor country – poor because it is poorly endowed with capital relative to the world – may actually experience an increase in its return to capital if it opens up to trade.

Furthermore, if this happens, it also accompanies a move by the economy into more capital-intensive production than what it was producing before, what we here are calling industrialization. The capital-intensive goods that it produces are of no use for it by themselves, however, but rather are intermediate inputs that need to be combined with even more capital-intensive intermediate inputs from the more developed world, to which the poor country exports them.

The poor country has a comparative advantage in these goods for two reasons. First, they are more labor-intensive than anything else produced in the rich world, so that the poor country's comparative advantage stems naturally from its labor abundance. And second, the even more labor-intensive good that the poor country produced in autarky is of no interest to consumers in the rich country, and thus does not provide an export opportunity. Instead, the switch to what are for it more capital-intensive goods bids up the return to capital, and pushes down the wage.

The following proposition summarizes the results from our model, focusing on results that are unconventional in the context of the standard Heckscher-Ohlin model:

Proposition 2. Assume that there exists a fully-industrialized (producing only good Y) large country in the world. The following are the effects of a small country, initially in autarky, opening to free trade with that large country.

i) If a small country is too poor, with its $k \leq k_X^{/}$, then *it will remain as an autarky economy*, producing and consuming only good X.

ii) If a small country is somewhat less poor, with $k_X^{/} < k \leq k_X$, then *trade*

will induce its industrialization, moving some of its resources into the industry producing good Y. Such trade-induced industrialization is possible because it can obtain (import) the more capital-intensive intermediate good N at a cost lower than its autarky cost, in exchange for exporting the more labor-intensive intermediate good M.

iii) As a result of this trade, *the rental on capital in the small country will rise to the level*, $r_X^/$, as long as its $k < k_M^/$ so that it does not complete its industrialization, continuing to produce good X as well as good M.

iv) *An increase in k in a small economy will accompany an expansion of trade*, both in absolute value and in the ratio of trade to the size of its economy, as long as it continues to rely on imports for its supply of good N with its rental on capital being higher than the rental in the large country, $r_N^/$; that is, as long as $k < k_M^{//}$.

The last result in Proposition 2 is unconventional because an expansion of trade between a poor country and a rich one here occurs when their relative factor endowments are becoming more similar with an increase in the capital endowment of the poor country. With the relative price of good Y being fixed, an increase in capital in the small country induces its resources to move from the labor-intensive traditional sector to the capital-intensive modern sector, following Rybczynski theorem. Because only the size of modern sector matters in determining the size of the small country's trade, this inter-sectoral movement of resources implies an expansion of its trade relative to the size of its economy

as well as in absolute value.[9] Even after the completion of its industrialization (no longer producing good X) with $k \geq k_M^{/}$, an increase in k will raise the absolute size of its trade because it continues to rely on imports for its supply of good N with $k < k_M^{//}$.

Also note that this last result of Proposition 2 implies complementarity between capital mobility and trade. If we allow free mobility of capital as well as free trade, then capital will move from the large developed country to the small developing country until the rental on capital in the small country falls to the large country's level. The resulting increase in k to the level of $k_M^{//}$ in the small country will accompany an expansion of trade according to Proposition 2 (iv).

4. The Experiences of Trade-induced Industrialization

As briefly discussed in the introduction, our model can be useful in understanding the experiences of developing countries that have pursued the export-oriented industrialization strategy, such as Hong Kong, Korea, Singapore, and Taiwan in the 1960s and 1970s, and more recently, China in the 1980s and 1990s. The rapid expansion of these countries' exports, which enabled their

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[9] The size of the modern sector in the small country represents the amount of its resources employed for the (eventual) production of good Y. With no domestic production of good N in the small country, the size of its modern sector is equal to the amount of resources employed to produce good M (for eventual production of good Y), having its capital and labor be employed at the ratio of $k_M^{/}$, in the absence of exporting good X in exchange for good N considered in Footnote 4. Even when the small country exports good X in exchange for good N, we can continue to apply the same definition in determining the size of the modern sector: It employs its capital and labor at the ratio of K_{XN}/L_{XN} in its modern sector (for the eventual production of good Y) instead of employing its resources at the ratio of $k_M^{/}$. An increase in k in the small country requires its resources to move from the traditional sector (for the domestic consumption of good X), which hires resources at the ratio of $k_X^{/}$, to the modern sector (for the eventual production of good Y), which hires resources either at the ratio of $k_M^{/}$ or at the ratio of K_{XN}/L_{XN}. Note that only the modern sector is involved in trade (importing good N in exchange for its output).

speedy industrialization, largely involves producing labor-intensive manufactured goods mostly destined toward rich countries such as the US and European countries as well as Japan.

A relatively less emphasized fact about these countries' industrialization through exports is an equally rapid expansion of imports of manufactured goods, especially capital-intensive intermediate inputs from rich countries. In the year 1966, for example, which Krueger (1979) identifies as the first year of the period during which the Korean economy emerged as a major exporter of manufactured goods (1966 – 1975), the "*net exports to gross*" ratio of manufactures (the difference between gross value of manufactured exports and the value of imports for export production, divided gross value of manufactured exports) discretely jumped down from above 90% in earlier years to less than 50%, and then stayed at such a low level throughout the period of 1966-1975.[10] This drastic drop in the domestic content of the manufactured exports of Korea, which has concurred with its rapid expansion of such exports, indicates that imports of intermediate inputs played an important role in its export expansion.

In the same year 1966, the percentage of manufactures, machinery and transport equipment imports in the total imports of Korea jumped from a low of 30% to well above 40% and then stayed at such a high level during the period 1966 to 1975, with its total export value rising from 248 to 5081 and its total import value rising from 716 to 7274, in millions of US dollars.[11] These facts conform well to our model's emphasis on the positive role of importing capital-intensive intermediate inputs in facilitating poor countries' exports of

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[10] These figures come from Table 36 of Krueger (1979).
[11] These figures come from Table 28, 36, and 37 of Krueger (1979).

manufactured goods to rich countries, which in turn enables their trade-induced industrialization.

While obtaining reliable data on the return to capital is difficult, one may regard the incremental capital-output ratio (the ratio of investment to growth of an economy) as a measure that is negatively correlated with the return to capital at a nation-wide level. According to Balassa (1980), incremental capital-output ratios in the 1960-73 period were 1.8 in Singapore, 2.1 in Korea, and 2.4 in Taiwan. This contrasts with the fact that these ratios were much higher for countries pursuing the import-substituting industrialization strategy – 5.5 in Chile, 5.7 in India, and 9.1 in Uruguay – showing that the returns to capital were much higher for countries pursuing export-oriented industrialization strategies.[12]

Instead of comparing these incremental capital-output ratios across countries that had taken different industrialization strategies, one may want to check how a change in a developing country's trade policy from import-substitution to export-orientation affects such a measure. In the case of Korea, for example, the incremental capital-output ratio significantly dropped, from 3.04 for the period of 1954-65 to 1.71 for the period of 1966-1975, indicating that the return to capital rose after it had effectively switched its policy from import-substitution to export oriented industrialization.[13] Possibly a more direct measure for the rental on capital is the real interest rate. The real interest rate in Korea stayed at a very high level during the period of 1966-1975, mostly having its curb-market rate above 30% and its rate on time deposits above 10%, except in those

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[12] These numbers come from the first Essay of Balassa (1980).
[13] These numbers were calculated based on Korean GDP and investment data from the Penn World Table Version 6.1.

later years affected by the first-oil shock. Once again, these facts accord well with our model's prediction of how a trade-induced industrialization may affect the return to capital in poor countries.[14]

It is well known that both the ratio of trade to GDP and the absolute value of trade were rapidly expanding for the countries pursuing export-oriented industrialization, especially in the early period of their industrialization during which their capital per labor ratio was rising fast. This again corresponds well with the prediction of our model of trade-induced industrialization: According to Proposition 2 (iv), there will be an expansion of trade between a poor country and a rich one in response to an increase in the capital endowment of the poor country, as long as their endowments are not similar enough to induce factor price equalization between them. Also recall that Proposition 2 (iv) implies complementarity between capital mobility and trade. In the case of Korea, it was borrowing heavily from rich countries to fill the gap between its domestic saving and investment during the period of 1960–85, at the same time that its trade with rich countries was expanding rapidly.

5. Conclusion

The success of the Asian Tiger economies in fostering industrialization through trade is well known, and it has provided the example that many other developing economies, which had attempted to industrialize through import substitution, have later followed. Trade economists have applauded that success, but aside from pointing to the conventional gains from trade, trade theory has

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[14] See Table 1 of Kim (2007)

not been particularly useful in explaining it. The textbook Heckscher-Ohlin Model would suggest that labor-abundant countries would specialize in even more labor-intensive goods if they pursued free trade, and this specialization would hardly constitute industrialization.

The model here, while just a particular version of the Heckscher-Ohlin Model expanded to include intermediate inputs in the industrial sector and made tractable by assuming perfect substitution between final goods, performs remarkably well for explaining such export-led industrialization. Its predictions conform well with the data that have been reported for the Tiger economies during the early decades of their success.

More, of course, remains to be done. The model here has been a very particular and special example, designed for expositional simplicity and understanding rather than generality. It remains to be seen what characteristics of a more general model, with more industries and a more general formulation of preferences, would be needed to generate comparable results. For example, we might conjecture that similar results would obtain in a model with multiple industries, each with both traditional and modern technologies. The modern technologies would need to involve greater complexity than the traditional technologies, in terms of intermediate inputs of varying but higher-than-traditional capital intensities. If such a more general theoretical result could be established, then it would then make sense to investigate actual technologies to see if they conform to those assumptions.

The model here is static and only addresses the effects of trade and the effects of capital accumulation. It does not explain that capital accumulation,

except in our suggestion that if capital were internationally mobile, then it would be attracted to the developing country when trade causes its return to capital to rise. It would be useful, however, to imbed this static model in a model of endogenous growth, to see if that trade-induced rise in return to capital would also stimulate capital accumulation. If so, then we would have not just a model of trade-induced industrialization, but also a model of trade-induced economic growth.

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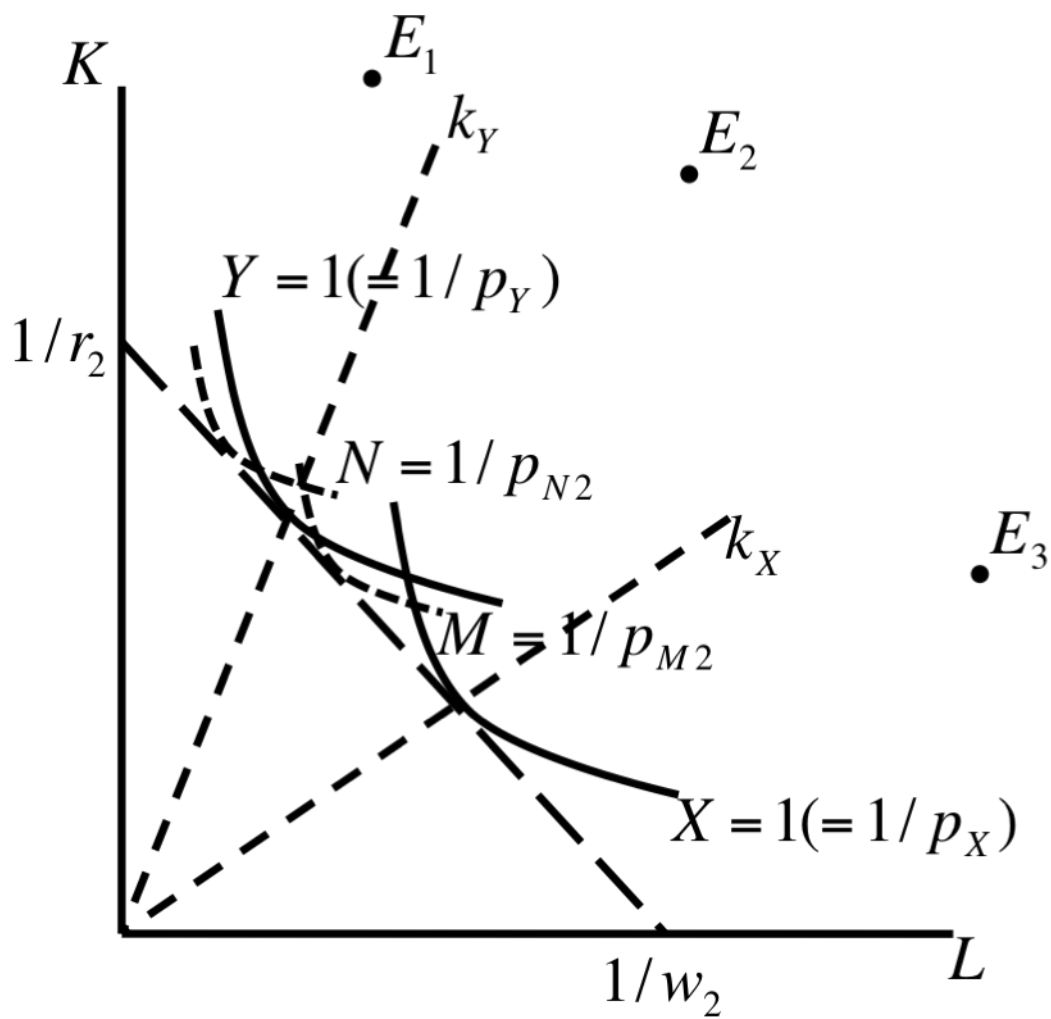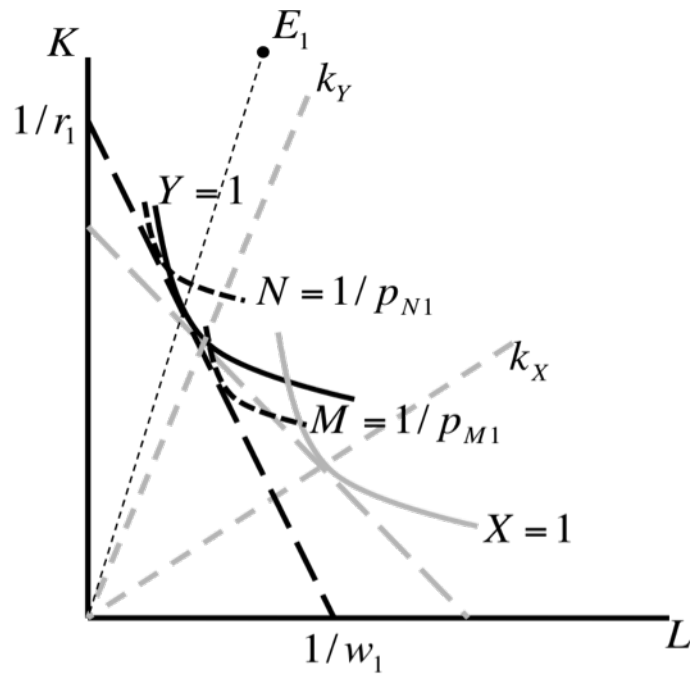
Figure 1: Autarky Equilibria

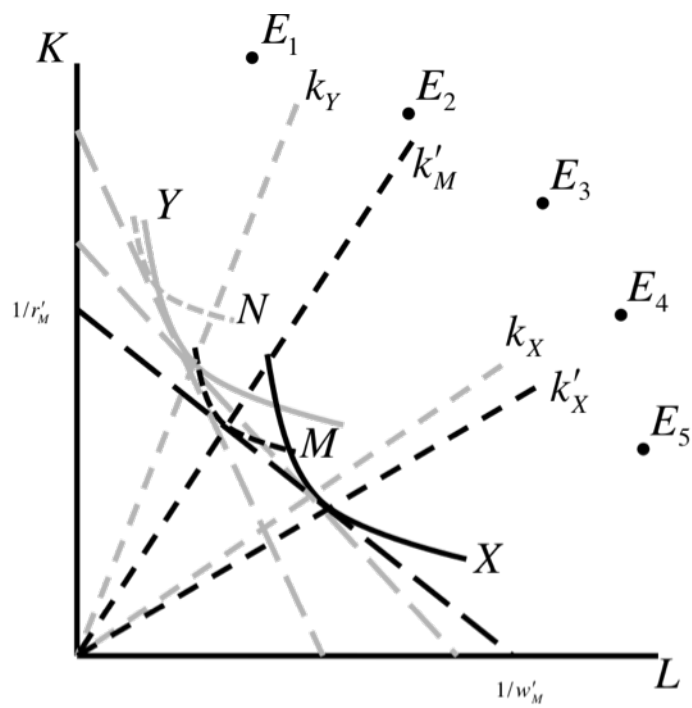Figure 2: Autarky Equilibrium in Capital-Abundant
Country

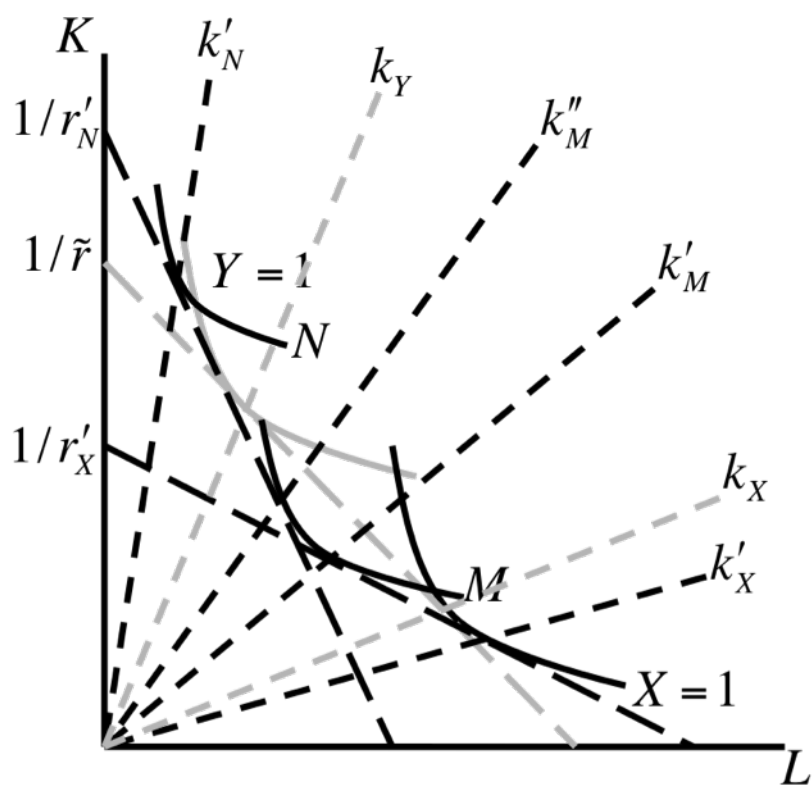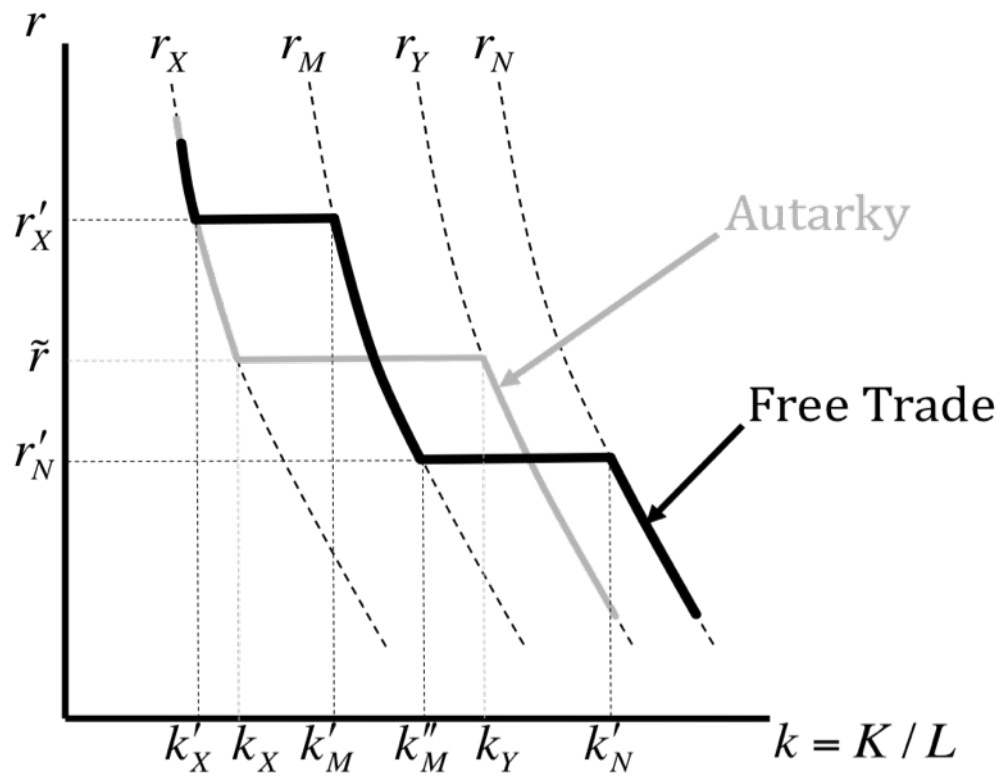Figure 3: Free Trade Options for a Small Poor Country

Figure 4: Free Trade Options for a Small Country

Figure 5: Capital Rentals in Autarky and Free Trade