

SOLUTION KEY

The University of Chicago
Department of Economics

ECON 17100:

Introduction to International Trade

Practice Midterm

Spring 2026

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Name:

Student ID:

Instructions

- This practice exam is intended to help you prepare for the in-class midterm.
- The actual midterm will be **closed-book, closed-notes** and timed at **80 minutes**.
- The exam consists of **3 problems** worth a total of **100 points**: Problem 1 (15 pts), Problem 2 (40 pts), Problem 3 (45 pts).
- Attempt the problems under exam-like conditions before consulting your notes or the solutions.
- Show all your work. Partial credit is awarded for correct approaches even if the final answer is incorrect.
- Most questions emphasize **graphical analysis and economic intuition** rather than algebraic derivation. Calculators will not be permitted on the actual exam; leave answers in simplified form.

Problem 1: True, False, or Uncertain**[15 points]**

For each of the following statements, argue whether it is true, false, or uncertain. Use economic reasoning, a graph, or a counterexample to support your answer. Full credit requires both correct classification **and** correct justification.

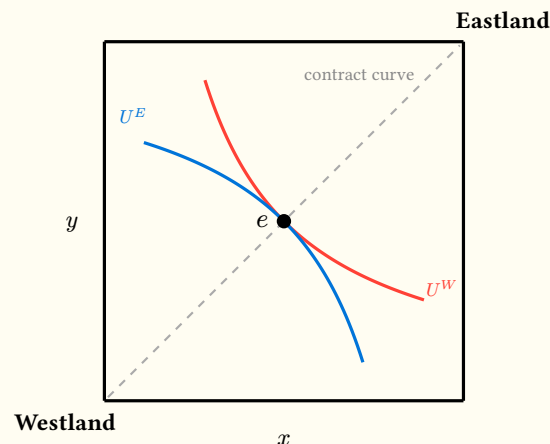
- (a) Consider an endowment economy with two countries and two goods. If both countries have identical preferences and identical endowment bundles — i.e., each country is endowed with exactly the same amount of each good — then there are no gains from trade. [7 pts]

Solution:

True. With identical preferences and identical endowment bundles, both countries have the same marginal rate of substitution at the endowment point:

$$MRS^E(x^e, y^e) = MRS^W(x^w, y^w).$$

In an Edgeworth box, the endowment point sits at the center of the box (each country holds exactly half of each total), and both countries' indifference curves are tangent there with the same slope. The endowment already lies on the contract curve, so it is Pareto efficient: no reallocation through trade can make either country strictly better off.



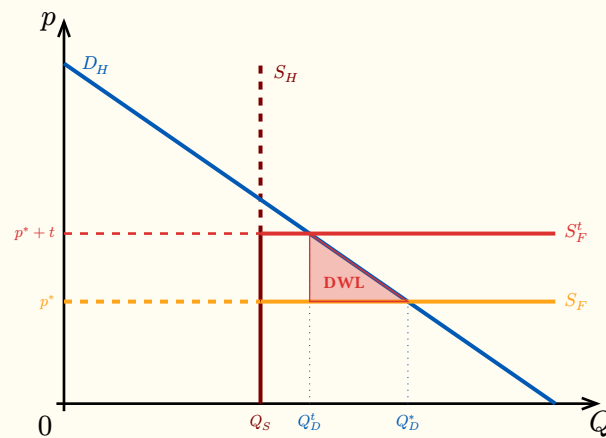
- (b) In a small open economy, if domestic supply of an imported good is perfectly inelastic (i.e., the supply curve is vertical), then an import tariff on that good generates no deadweight loss. [8 pts]

Solution:

False. In a small open economy, foreign producers supply the imported good in unlimited quantities at the world price p^* — the **foreign supply curve S_F is horizontal** at p^* . A specific tariff t shifts the foreign supply curve faced by home agents **up** to S_F^t (each unit landing in the home market must now pay t), so domestic consumers and producers transact at $p^* + t$ instead of p^* .

Deadweight loss in this setup is the sum of **two** triangles — a **production-side** triangle (between S_H and the price wedge, as domestic output expands along S_H) and a **consumption-side** triangle (between D_H and the wedge, as consumers cut purchases). With a vertical S_H , Q_S does not move

when S_F shifts up, so the production-side triangle collapses to zero. But as long as D_H slopes down, Q_D still falls from Q_D^* (where D_H meets S_F) to $Q_D^t < Q_D^*$ (where D_H meets S_F^t), and the **consumption-side** triangle — bounded above by D_H , below by S_F , between Q_D^t and Q_D^* — has strictly positive area. Total DWL > 0 .



Intuition: deadweight loss arises from **any** margin that responds to the upward shift of foreign supply. Inelastic S_H shuts down the production margin; the consumption margin still bites.

Problem 2: The China Shock in the US Labor Market [40 points]

Consider the United States as a two-sector economy:

- **Manufactures** (M), produced using **mobile labor** L_M and **sector-specific capital** K :

$$Q_M = F(K, L_M),$$

with F exhibiting diminishing marginal product of labor ($F_{LL} < 0$).

- **Services** (S), produced using **mobile labor** L_S and **sector-specific human capital** H :

$$Q_S = G(H, L_S),$$

with G also exhibiting diminishing marginal product of labor ($G_{LL} < 0$).

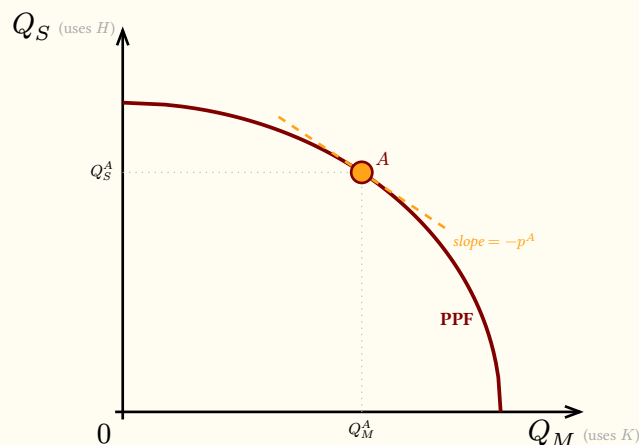
Labor is perfectly mobile across sectors: $L_M + L_S = \bar{L}$. Capital K is stuck in manufacturing; human capital H is stuck in services. Let $p = p_M/p_S$ denote the relative price of manufactures, with $p_S = 1$ as numeraire.

In the initial **autarky** equilibrium, the relative price of manufactures is p^A . The US then **opens to trade**: at the world relative price, manufactures are relatively cheaper than they were at home, so the US ends up at a free-trade relative price $p^W < p^A$.

- (a) Sketch the US PPF in the (Q_M, Q_S) plane (Q_M on the horizontal axis, Q_S on the vertical axis). Label each axis with the specific factor that produces that good. Mark the US autarky production bundle with a dot labeled A . In one sentence, explain **why** the PPF is concave (rather than linear). [6 pts]

Solution:

PPF is concave (bowed outward). Concavity comes from **diminishing marginal product of labor in each sector** given the fixed specific factors K and H : as labor is reallocated from S to M , each additional worker in M produces less than the previous one, while each worker released from S gave up more output than the last. The PPF runs from the Q_S -intercept (all labor in S) to the Q_M -intercept (all labor in M); the autarky bundle A sits in the interior, where the tangent line — with slope $-p^A$ — touches the frontier.



(b) Draw the two-sector labor-market diagram. The horizontal axis has total length $\bar{L}$; [8 pts] measure L_M from the left origin and L_S from the right origin (so any point on the axis corresponds to a specific labor split). Plot the marginal-revenue-product curves:

$$\text{MRP}_M^{\text{aut}}(L_M) = p^A \cdot F_L(K, L_M), \quad \text{MRP}_S(L_S) = G_L(H, L_S).$$

Mark the autarky labor allocation (L_M^A, L_S^A) and the equilibrium wage w^A . State in one sentence the equilibrium condition that pins down this allocation.

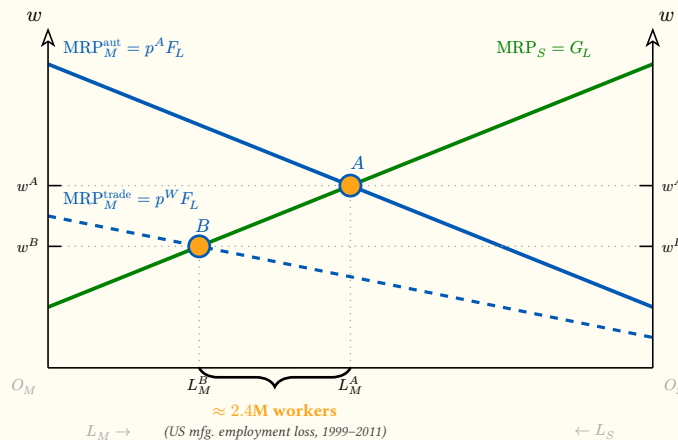
Solution:

Standard two-axis MRP diagram:

- $\text{MRP}_M^{\text{aut}}$ is downward-sloping as L_M increases (from left).
- MRP_S is downward-sloping as L_S increases (from right) — so it looks upward-sloping in the figure when read left-to-right.
- The two curves intersect at the autarky labor allocation A ; the height at the intersection is the common wage w^A .

Equilibrium condition: **labor mobility equalizes the marginal revenue product of labor across sectors,**

$$p^A \cdot F_L(K, L_M^A) = w^A = G_L(H, L_S^A).$$



(c) On your MRP diagram, show how the curves shift after the US opens to trade (the relative price of M falls from p^A to p^W). Mark the new labor allocation (L_M^B, L_S^B) and the new wage w^B . On your PPF diagram, mark the new production bundle B . In one or two sentences, describe how labor reallocates across sectors and how US manufacturing output changes. [8 pts]

Solution:

MRP_M shifts **down** (scaled by the new lower price): $\text{MRP}_M^{\text{trade}} = p^W F_L(K, L_M)$ lies strictly below $\text{MRP}_M^{\text{aut}}$ for every L_M . MRP_S is unchanged. The new intersection sits **to the right** of the old one on the L_S -axis (equivalently, to the left on the L_M -axis), at a **lower** wage $w^B < w^A$. Labor reallocates

out of M into S : $L_M^B < L_M^A$, $L_S^B > L_S^A$. Q_M falls and Q_S rises; on the PPF, the production point moves along the frontier from A (higher Q_M) to B (higher Q_S , lower Q_M).

(d) Using the MRP diagram, explain how opening to trade affects the **real** returns to each of [10 pts] the three factors. In each case, state the direction of the change (rises, falls, or ambiguous) and give a one-sentence reason.

1. The real wage of US workers (mobile labor).
2. The real return to manufacturing capital K .
3. The real return to services human capital H .

Solution:

1. **Ambiguous (classic SF result).** The nominal wage w falls. In terms of services, $w/p_S = w$ falls (since L_S rose, G_L fell). But in terms of manufactures, $w/p_M = F_L(K, L_M)$ **rises** (since L_M fell, F_L rose). Workers buy less S per hour of work but more M per hour; the net welfare effect depends on their consumption basket.
2. **Falls.** The return to capital is $r_K = p_M \cdot F_K(K, L_M)$. Both p_M fell **and** L_M fell (so F_K fell, since K and L_M are complements). Both effects lower r_K – in terms of both goods, manufacturing capital unambiguously loses.
3. **Rises.** The return to human capital is $r_H = p_S \cdot G_H(H, L_S) = G_H(H, L_S)$. L_S rose, so G_H rose. r_H rises in terms of services; and since p_M fell, r_H/p_M rises even more in terms of manufactures. Services-specific human capital unambiguously gains.

Bottom line: the factor **specific to the shrinking sector loses**, the factor **specific to the expanding sector gains**, and the **mobile factor is ambiguous**.

(e) Autor, Dorn, and Hanson (2013) estimate that roughly 2.4 million US manufacturing jobs [8 pts] were lost between 1999 and 2011 due to Chinese import competition. Is the **sign** of your predicted change in US manufacturing employment consistent with their estimate? On your MRP diagram, label the segment that represents this loss of ≈ 2.4 million workers.

Solution:

Sign match. The model predicts $L_M^B < L_M^A$: US manufacturing employment falls when the relative price of manufactures falls. Autor, Dorn, and Hanson's estimate of a 2.4-million-job loss has the same sign.

Labeling. On the MRP diagram, the horizontal segment from L_M^B to L_M^A (equivalently, from L_S^A to L_S^B when read from the right origin) is the manufacturing labor reallocation. Empirically, this segment corresponds to the ≈ 2.4 million workers who left US manufacturing between 1999 and 2011.

Problem 3: Bangladesh and the Rise of Labor-Intensive Exports [45 points]

Between 1980 and 2023, Bangladesh's garment exports grew from roughly 1.8 million to 47 billion US dollars, making the country the world's third-largest garment exporter. Firms and observers credit Bangladesh's abundance of low-cost labor: the country's minimum wage stood near \$113 per month in the 2020s, compared with roughly \$800 in China. This problem uses a minimal 2×2 Heckscher–Ohlin model to rationalize that pattern.

Setup. Two economies — Bangladesh (Bgd) and the rest of the world (RoW) — trade two goods, garments G and agricultural commodities A , using two factors, labor L and land T . Factors are mobile across sectors within a country and immobile across countries. Technologies are Cobb–Douglas and identical across countries,

$$Q_G = L_G^{3/4} T_G^{1/4}, \quad Q_A = L_A^{1/4} T_A^{3/4},$$

so the land share is $\alpha_G = 1/4$ in garments and $\alpha_A = 3/4$ in agriculture (hence G is labor-intensive, A is land-intensive). Preferences are identical, homothetic, and Cobb–Douglas with equal budget shares on each good, so the aggregate relative demand is

$$RD(p) = 1/p, \quad \text{where } p \equiv p_G/p_A.$$

Factor markets are perfectly competitive and there are no factor-intensity reversals. Initial endowments:

	L	T	$n = T/L$
Bangladesh	400	100	?
RoW	100	400	?

- (a) Compute $n = T/L$ for each country. Which country is labor-abundant, which is land-abundant? By the **Heckscher–Ohlin theorem**, which good does Bangladesh export under free trade? Briefly explain the intuition in one or two sentences (why does factor abundance determine the direction of trade?). [7 pts]

Solution:

$n^{\text{Bgd}} = 100/400 = 1/4$ and $n^{\text{RoW}} = 400/100 = 4$, so **Bangladesh is labor-abundant** ($n^{\text{Bgd}} < n^{\text{RoW}}$) and RoW is **land-abundant**. By the H–O theorem, each country exports the good that uses its abundant factor intensively: **Bangladesh exports G (labor-intensive, garments), RoW exports A (land-intensive).**

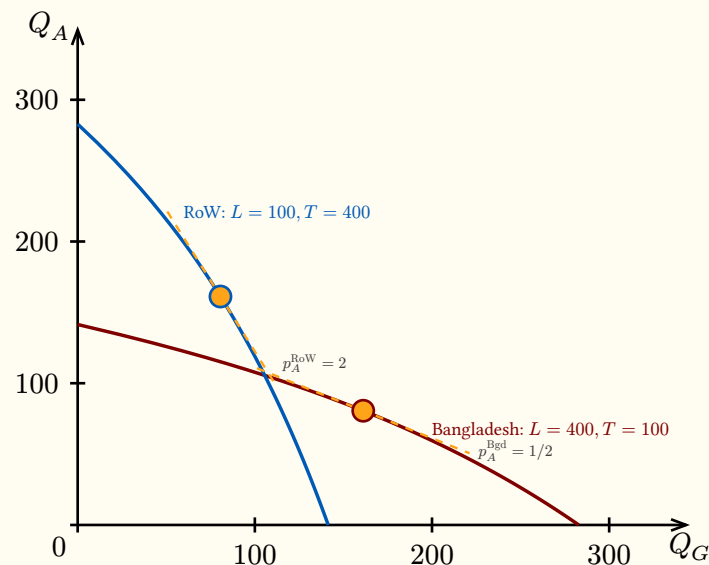
Intuition: the abundance of a factor makes it **relatively cheap** in autarky, which makes the good that uses it intensively relatively cheap. Opening to trade, each country exploits that cost advantage — cheap labor in Bangladesh $\Rightarrow$ cheap garments $\Rightarrow$ garments are Bangladesh's comparative advantage.

- (b) For this calibration, the model pins down autarky prices uniquely: $p_A^{\text{Bgd}} = 1/2$ and $p_A^{\text{RoW}} = 2$ (you do **not** need to derive these). On a common (Q_G, Q_A) diagram, sketch both countries' [8 pts]

PPFs and mark each country's autarky production bundle with a dot, together with the autarky price line (tangent to the PPF, slope $-p_A$). In one sentence, explain why Bangladesh's PPF is bowed toward the Q_G -axis.

Solution:

At every level of G along the frontier, Bangladesh gives up less A per additional unit of G than RoW does. Producing one more G means reallocating relatively more labor (the factor G uses intensively) out of A . In Bangladesh labor is abundant: there are many workers per acre of land in A , so the marginal worker's contribution to A output is low – pulling one worker into G barely dents A . In RoW the calculus is reversed: labor is scarce relative to land in A , so each worker is the binding input there and their marginal product in A is high – moving one worker into G reduces A output sharply. Because this gap holds at every Q_G , Bangladesh's PPF is everywhere flatter than RoW's, which is exactly what “**bowed toward the Q_G -axis**” means geometrically.

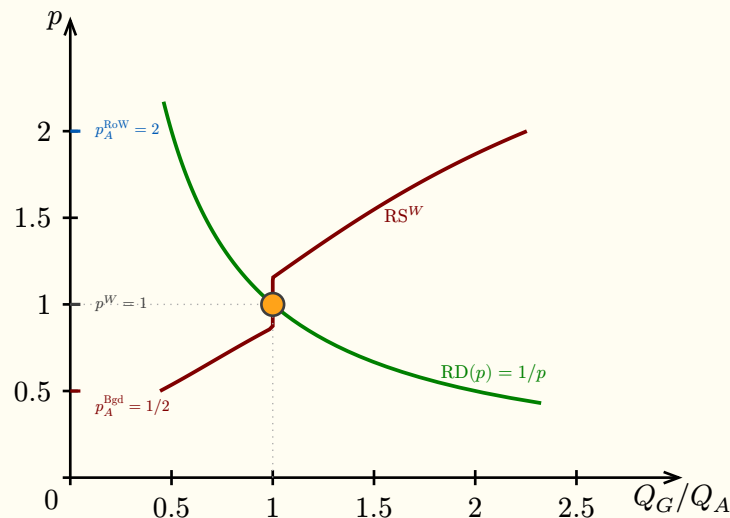


Bangladesh's autarky tangency has slope $-1/2$ (flatter – G is relatively cheap when labor is abundant); RoW's has slope -2 (steeper – A is relatively cheap when land is abundant).

(c) On a **separate** diagram with Q_G/Q_A on the horizontal axis and $p = p_G/p_A$ on the vertical axis, sketch the world relative supply curve RS^W and the relative demand curve $RD(p) = 1/p$. Mark each country's autarky price on the vertical axis. The free-trade world price for this calibration is $p^W = 1$; mark the free-trade equilibrium. Explain in one or two sentences why p^W must lie **strictly between** the two autarky prices.

Solution:

RS^W is upward-sloping: when p rises, both countries shift resources toward G , so world Q_G/Q_A rises. $RD(p) = 1/p$ is downward-sloping. The free-trade price $p^W = 1$ lies strictly between $p_A^{Bgd} = 1/2$ and $p_A^{RoW} = 2$.



Why strictly between? If p^W coincided with Bangladesh's autarky price, RoW consumers would want to buy cheap garments but no producer would have any incentive to supply extra — the price would be bid up. Symmetrically at RoW's autarky price, Bangladeshi producers would flood the market and push p down. The interior price is the one that clears both markets. (For this calibration, RS^W has a flat segment near $Q_G/Q_A = 1$ where both countries fully specialize; the free-trade equilibrium sits on that flat segment, exactly at $p^W = 1$. During the exam, you do not need to account for the flat segment when sketching the relative supply curve.)

(d) Bangladesh opens to trade. The relative price of its labor-intensive good (garments) **rises** [12 pts] from $p_A^{\text{Bgd}} = 1/2$ to $p^W = 1$. Using the **Stolper–Samuelson theorem** (the “magnification effect”):

1. Which Bangladesh factor price — the wage w or the land rent r — rises in real terms, and which falls? (You should be able to answer without any calculation, using only factor intensities and the direction of the price change.)
2. Who in Bangladesh gains in real terms from opening to trade, and who loses?
3. Is your answer consistent with the general H–O prediction that *trade benefits the abundant factor and hurts the scarce factor*? Explain in one sentence.

Solution:

1. Opening to trade **raises** the relative price of the labor-intensive good G in Bangladesh. By Stolper–Samuelson, a rise in the relative price of the labor-intensive good **raises** the real return to the factor used intensively in that good (labor) and **lowers** the real return to the other factor (land) in terms of **both** goods. The magnification chain is

$$\hat{r} < \hat{p}_A < \hat{p}_G < \hat{w},$$

i.e., wages rise by **more** in proportional terms than the rise in p_G , and land rents fall in real terms even though p_A is unchanged. So **real wages rise, real land rents fall**.

2. **Bangladeshi workers gain; Bangladeshi landowners lose.**

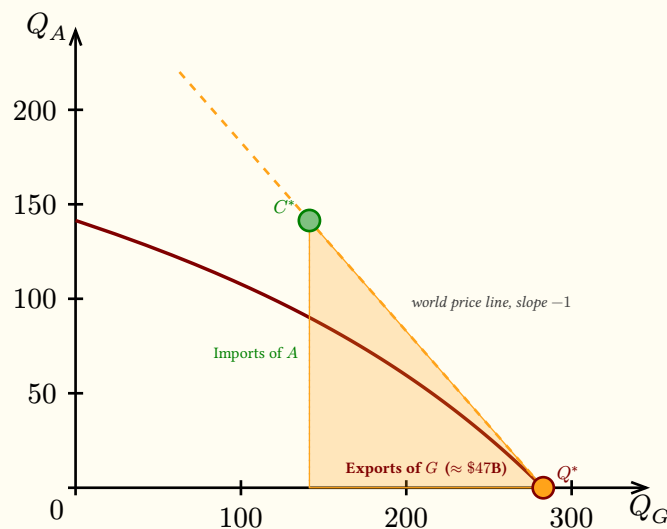
3. **Yes.** Bangladesh is **labor-abundant**, so labor is the abundant factor. Opening to trade raises the real return to the abundant factor (labor) and lowers the real return to the scarce factor (land), exactly as H–O–Stolper–Samuelson predicts.

(e) Bangladesh's garment exports grew from roughly \$1.8 million in 1980 to \$47 billion in 2023, while its share of exports from land-intensive agricultural commodities fell dramatically over the same period. Is the **sign** of this sectoral reallocation (more G , less A) consistent with your H–O prediction? On a sketch of Bangladesh's PPF **after** opening to trade (showing the production point Q^* , the consumption point C^* , and the world price line through them), label the graphical element representing the $\approx \$47$ billion of garment exports. Give **one** reason the simple 2×2 H–O model might over- or under-state the **speed** or the **scale** of Bangladesh's transformation.

Solution:

Sign match. The model predicts Bangladesh specializes toward the labor-intensive good when it opens, so exports (and production) of G rise relative to A . The 1980–2023 export pattern – garments up from 1.8 million to 47 billion, agriculture share falling – has the same sign.

Labeling \$47 billion of garment exports. On Bangladesh's post-trade PPF, the production point Q^* sits where the world price line of slope $-p^W = -1$ is tangent to the PPF; for this calibration that tangency hits the corner of the PPF (full specialization in G). The consumption point C^* sits on the same price line at the tangency with the highest reachable indifference curve (north-west of Q^* : less G , more A than at production). The two points and the price line together form the **trade triangle**, with horizontal leg $Q_G^* - C_G^*$ (positive – garment exports) and vertical leg $C_A^* - Q_A^*$ (positive – agricultural imports). The horizontal leg represents “ $\approx \$47$ billion” – it is the difference between Bangladesh's domestic garment production and its garment consumption, i.e., its garment exports.



Examples of limitations:

- **Under-states the scale** because H-O abstracts from **capital accumulation** and **technology transfer**. Bangladesh's garment sector grew in part because Korean and Hong Kong firms brought in production technology and capital, creating a dynamic that static H-O cannot capture.
- **Omits Rybczynski-style endowment growth**. Bangladesh's labor force more than doubled since 1980 — a classic Rybczynski shock that expands labor-intensive output even at fixed prices, adding to the H-O price-channel effect.
- **Over-states the scale** because the 2×2 model lumps all land-intensive production into one sector. In reality, Bangladesh retained significant agriculture and diversified into other labor-intensive manufactures (leather, electronics assembly); the real shift was into many labor-intensive sectors rather than purely into G .
- **Under-states adjustment costs** because H-O assumes frictionless factor mobility. Rural-to-urban migration, training of garment workers, and building factory infrastructure took decades — the model predicts adjustment would be instant.

Scratch Paper

This page is for rough work only. Work on this page will not be graded.

– END OF EXAM –

Please review your answers before submitting.