Professor Robert Staiger

Fall 2023/24

Economics 39F: First Midterm

Please be concise and to the point. Print your name on your exam and turn it in with your blue books. You have 65 minutes. The exam has 50 points. Answer Part I and *either* question 1 or 2 from Part II. Good luck!

Part I (30 points). On September 23rd, the *New York Times* ran an Opinion column by the Editorial Board with the title "The U.S. Is Pulling Back From China. How Far Is Too Far?" that stated in part:

> Many Americans, even once-ardent proponents of globalization, have soured on trade with China. But there is a growing danger that as the United States tries to address its difficulties with China, it will pull back too far, severing economic ties that benefit American families and contribute to global peace and prosperity.
>
> The relationship problems are real, and cannot be minimized. Chinese industrial subsidies, often maintained despite promises to the contrary, stripped millions of jobs from America's industrial heartland. Chinese companies flagrantly steal American innovations. China's increasingly confrontational posture toward the United States and its allies … have underscored the need for the United States to align trade policy more closely with other aspects of America's national interest.
>
> A new rule book is needed. Too few leaders, however, appear willing to note that Americans also benefit from trade with China … Despite the rising tensions, trade between the countries remains extremely strong. China is America's third-largest trading partner, after Canada and Mexico … U.S. imports of goods and services from China hit a record $563.6 billion in 2022. The goal of American policymakers ought to be safeguarding the vast majority of those trade flows while addressing the problems that have emerged.

President Biden has read this Opinion column and has asked his Council of Economic Advisers (CEA) to help him evaluate the tradeoffs that will have to be made to "align trade policy more closely with other aspects of America's national interest." In particular, he has asked the CEA to provide him with an upper bound for the cost to the US economy if, to achieve national security goals and other interests of the United States, he had to adopt policies that reduced US imports by $563.6 billion, the value of US imports from China in 2022.

You have been hired to assist the staff economists at the CEA over the winter break, and your first task is to help them provide President Biden with the upper bound that he is seeking. The staff has decided that they will first calculate an upper bound for the cost to the US of moving all the way to autarky, and then multiply this upper bound by 0.14, the fraction of total US imports in 2022 ($4.0 trillion) that was accounted for by US imports from China ($563.6 billion), to give the President the upper bound he has requested. *So they need your help in calculating an upper bound for the following magnitude: At existing (free trade) prices, how much would the United States be willing to pay not to go back to autarky?* Please answer the following questions:

(a) You are initially given very little information to go on. The CEA staff economists have informed you that the value of total US imports in 2022 was $4 trillion, and that the value of US national income in 2022 was $25.5 trillion, and they have noted that the US import penetration ratio for 2002 was therefore ImpPenRatio=($4.0 trillion)/($25.5 trillion) = 15.7%. *Explain to the CEA staff economists why this information alone is insufficient to say anything useful* about the upper bound that President Biden is seeking, using the graphs of the Basic Trade Model to support your explanation.

(b) You are then asked what additional information you would need in order provide President Biden with the upper bound he has requested. *Tell the staff what this additional information is, and with reference* *to the graphs you drew for part (a) explain under what conditions with this additional information you could then provide the President with the upper bound he is seeking* (once your number is multiplied by 0.14 as described above).

Part II. Answer *either* question 1 or question 2 below.

1. (20 points) In class while discussing the papers of Bernhofen and Brown (2004, 2005), we learned that the Slutsky Equivalent Variation (SEV) measure of a country's gains from trade is an upper bound on the Hicksian Equivalent Variation (HEV) measure of the country's gains from trade, and that the DDN Index was an upper bound on SEV, so that DDN≥SEV≥HEV. Using the Basic Trade Model, answer the following questions:

(a) Show that *SEV is in fact exactly equal to HEV (SEV=HEV) if a country's preferences are Leontief* (i.e., its indifference curves are right-angles).

(b) Show that *DDN is in fact exactly equal to SEV (DDN=SEV) if a country's production is fixed* (i.e., it acts like an exchange economy).

2. (20 points) It may seem puzzling that a country could gain from trade under conditions of balanced trade, because by the balanced trade condition this would mean that the value of what the country is obtaining from other countries (its imports) is exactly equal to the value of what the country has to give up (its exports) in exchange, where the valuation is done with the prices at which the countries trade. Show that this puzzle can be resolved, and that the value of what the country is obtaining from other countries (its imports) is actually greater than the value of what the country has to give up (its exports) in exchange, provided that this valuation is done with the "right" (i.e., autarky) prices. Specifically, use the Basic Trade Model to answer the following questions:

(a) Show that if a country maintains balanced trade and is *trading freely* with the rest of the world, *the value of the country's imports, valued at its autarky prices, must be greater than the value of the country's exports, valued at its autarky prices.*

(b) Show that if a country maintains balanced trade and has imposed *a non-prohibitive tariff on imports* from the rest of the world, *the value of the country's imports, valued at its autarky prices, must be greater than the value of the country's exports, valued at its autarky prices*.

Sketch of Answers
First Midterm Exam Econ 39F 2023-24

Part I

We are asked to help the CEA staff economists calculate for President Biden an upper bound for the following magnitude: "At existing (free trade) prices how much would the United States be willing to pay not to go back to autarky?" We are given two specific questions to answer.

(a) First, the only information we are given by the CEA staff is that the US import penetration ratio in 2022 was 15.7%. We are to use the graphs of the Basic Trade Model to explain to the CEA staff why this information alone is insufficient to say anything useful about the upper bound that President Biden is seeking.

The three graphs on the next page illustrate why this is so.

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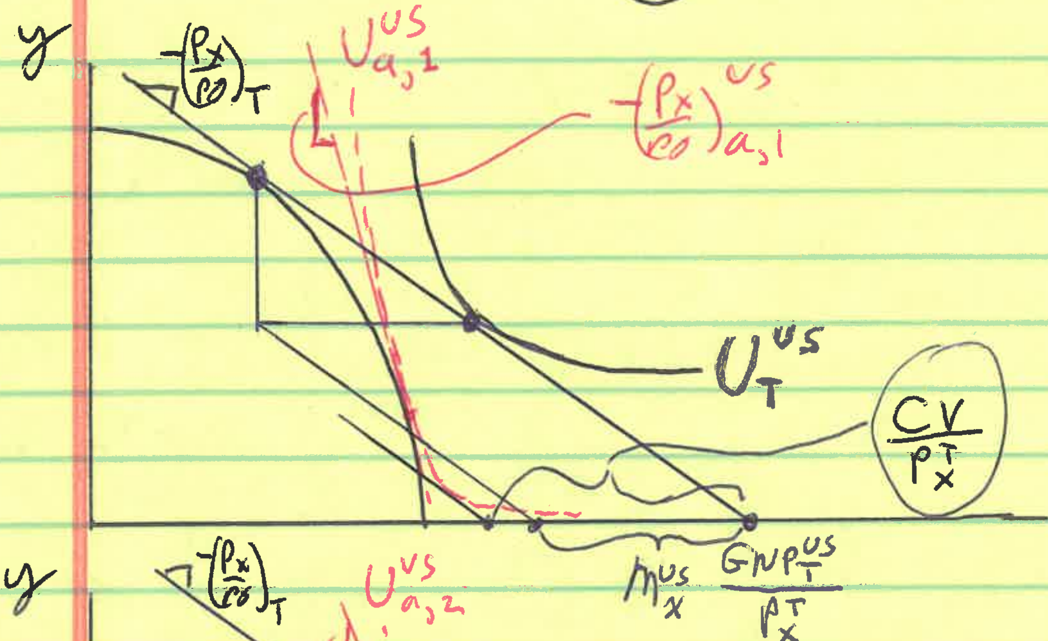
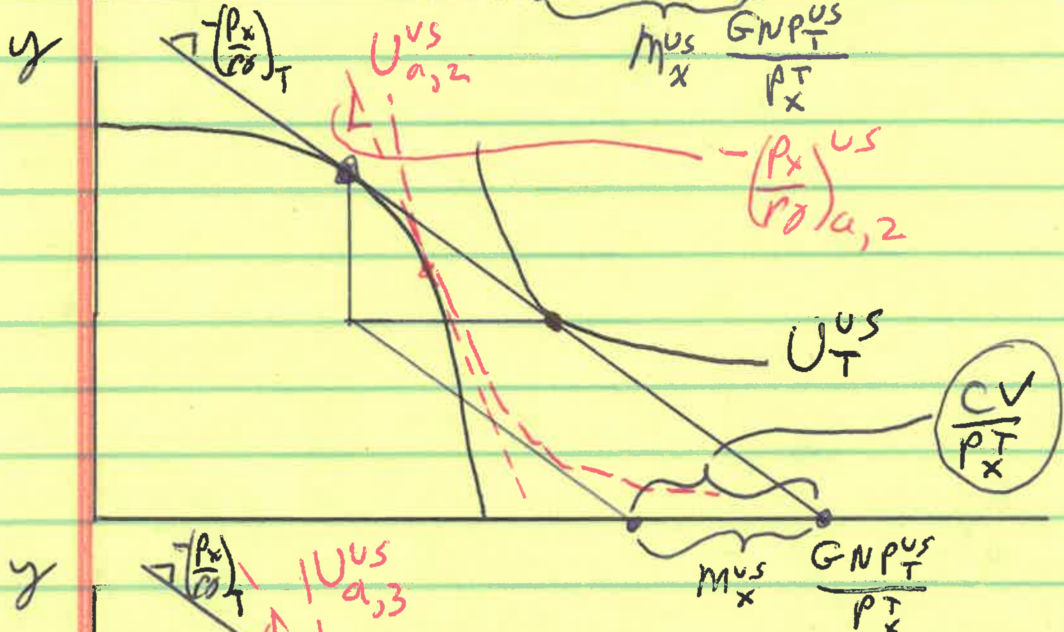
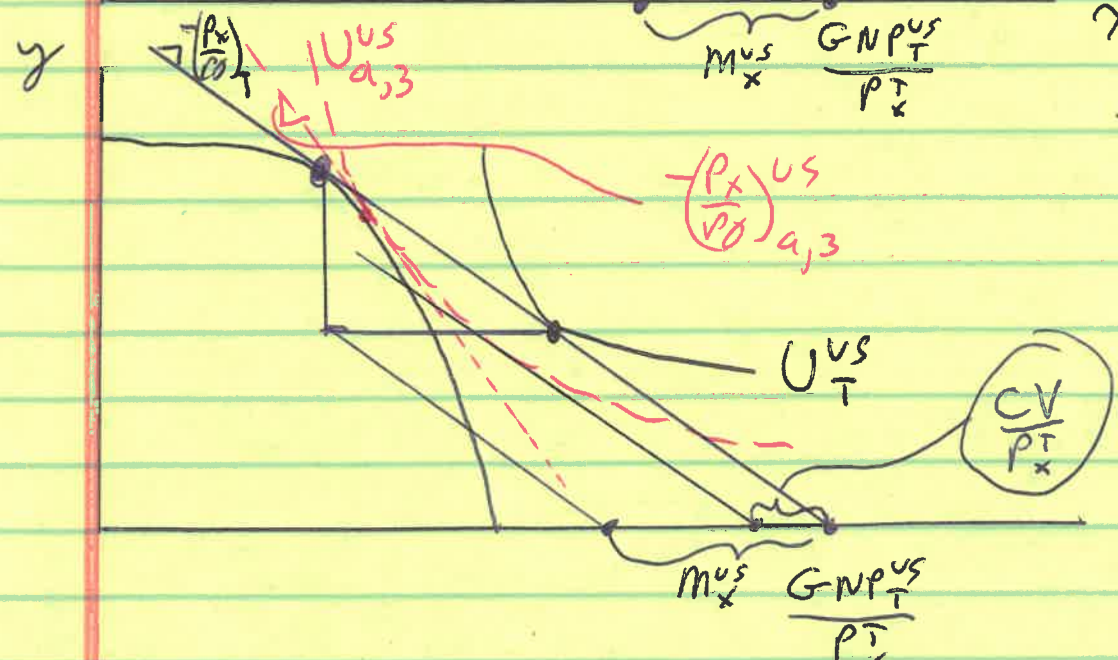


Possibility 1



Possibility 2



Possibility 3

③

We would like to know if the US import penetration ratio 15.7% is the upper bound that President Biden is looking for.

The top figure on the previous page illustrates one possibility:

$$\frac{CV}{GNP^{US}_{T}} = \frac{CV/P^{T}_{x}}{GNP^{US}_{T}/P^{T}_{x}} > \frac{m^{US}_{x}}{GNP^{US}_{T}/P^{T}_{x}} = \frac{P^{T}_{x}m^{US}_{x}}{GNP^{US}_{T}} = 15.7\%$$

So for Possibility 1, the US import penetration ratio is a lower bound on $\frac{CV}{GNP^{US}_{T}}$, a measure of US gains from trade.

The middle figure on the previous page illustrates a second possibility:

$$\frac{CV}{GNP^{US}_{T}} = \frac{CV/P^{T}_{x}}{GNP^{US}_{T}/P^{T}_{x}} = \frac{m^{US}_{x}}{GNP^{US}_{T}/P^{T}_{x}} = \frac{P^{T}_{x}m^{US}_{x}}{GNP^{US}_{T}} = 15.7\%$$

So for Possibility 2, the US import penetration ratio is an exact measure of $\frac{CV}{GNP^{US}_{T}}$.

The bottom figure on the previous page illustrates the third possibility:

$$\frac{CV}{GNP^{US}_{T}} = \frac{CV/P^{T}_{x}}{GNP^{US}_{T}/P^{T}_{x}} < \frac{m^{US}_{x}}{GNP^{US}_{T}/P^{T}_{x}} = \frac{P^{T}_{x}m^{US}_{x}}{GNP^{US}_{T}} = 15.7\%$$

So for Possibility 3, the US import penetration ratio is an upper bound on $\frac{CV}{GNP_T^{US}}$.

As these 3 figures illustrate, if we only know the US import penetration ratio, we can't say which of the three possibilities illustrated by these figures is the relevant one, and so we can't say anything useful to President Biden with this information alone: Without knowing which autarky indifference curve is correct,

$$\frac{CV}{GNP_T^{US}} \overset{?}{\gtreqless} 15.7\%.$$

(b) We are now asked what additional information we would need, beyond the US import penetration ratio, to be able to be able to provide President Biden with the upper bound he is seeking. And we are asked to make use of the graphs we drew for part (a) to explain our answer here.

As we learned in class from our discussion of the ACR (2012) paper, we would need to know that the US import demand elasticity was sufficiently

(5)

high (specifically larger in magnitude than +1 according to the ACR formula) if we are going to use the US import penetration ratio 15.70% as an upper bound on US gains from trade as measured by $\frac{CV}{GNP_T^{US}}$.

We can use the graphs we drew for part (a) to explain why. The key thing to note is that the US autarky prices implied by each of the US autarky indifference curves drawn for the three possibilities are different, with

$$\left(\frac{P_x}{P_y}\right)_{a,1}^{US} > \left(\frac{P_x}{P_y}\right)_{a,2}^{US} > \left(\frac{P_x}{P_y}\right)_{a,3}^{US}.$$

With the $\%\Delta$ in import volume from the trading situation to autarky being -100%, and with the $\%\Delta$ in $\frac{P_x}{P_y}$ moving from $\left(\frac{P_x}{P_y}\right)_T$ to $\left(\frac{P_x}{P_y}\right)_a$ therefore satisfying

$$\left(\%\Delta\frac{P_x}{P_y}\right)_1 > \left(\%\Delta\frac{P_x}{P_y}\right)_2 > \left(\%\Delta\frac{P_x}{P_y}\right)_3,$$

and with the US import demand elasticity defined as

$$\epsilon_m^{US} \equiv \frac{\%\Delta M^{US}}{\%\Delta\left(\frac{P_x}{P_y}\right)^{US}},$$ we then know that

$$|\epsilon_{m,1}^{US}| < |\epsilon_{m,2}^{US}| < |\epsilon_{m,3}^{US}|.$$

(6)

This means that we can conclude that the US is in Possibility 2 or Possibility 3, and hence that the US import penetration ratio is an upper bound on $\frac{CV}{GNP_T^{US}}$, if $|\epsilon_m^{US}|$ is big enough (and according to the ACR formula, if it is bigger than 1).

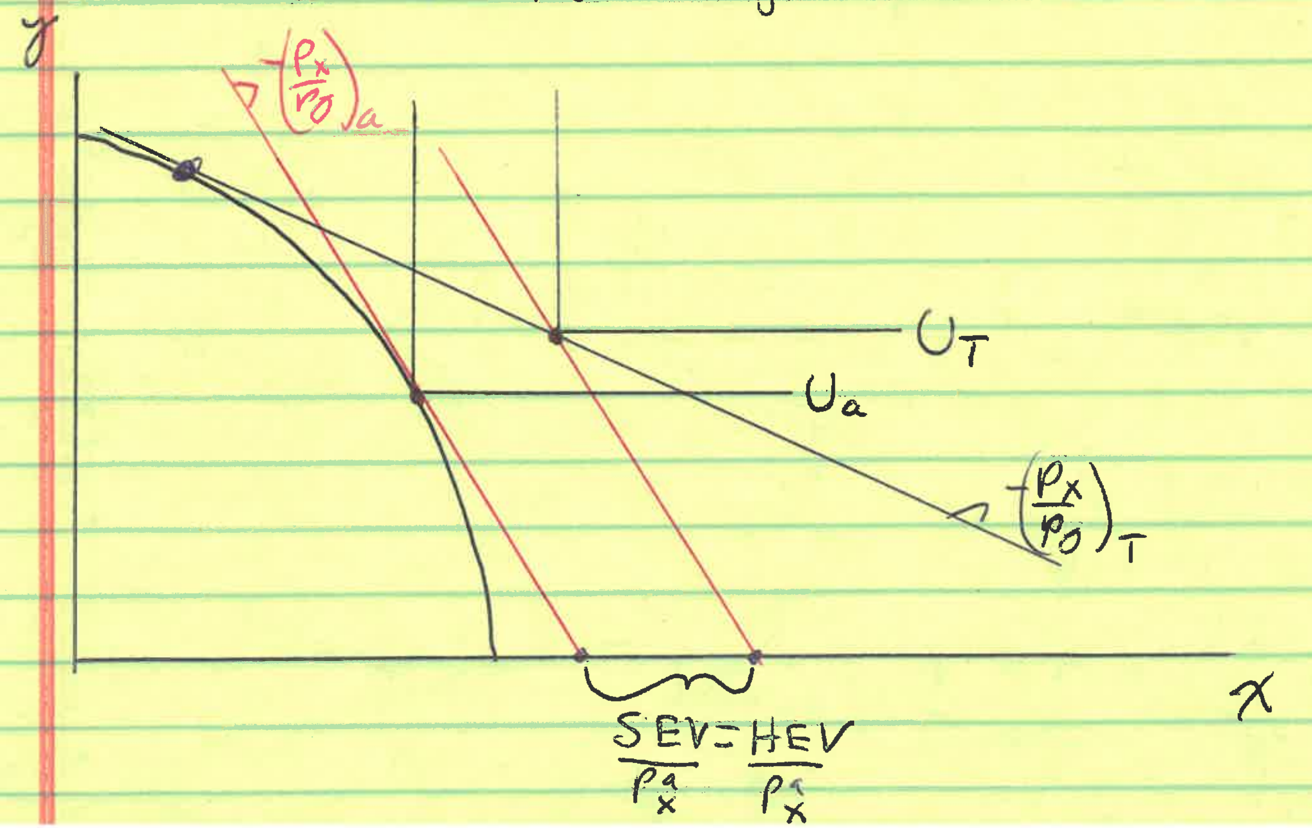
The upshot is that if we are given the US import demand elasticity in addition to the US import penetration ratio, and if the US import demand elasticity is big enough in magnitude, then we can use the US import penetration ratio of 15.7% as the upper bound President Biden is looking for (once we have multiplied it by 0.14 as the problem discusses, so that the upper bound that President Biden asked for is actually

$$0.14 \times 15.7\% = 2.2\%).$$

Part II

1. We are asked to use the Basic Trade Model to answer 2 questions about the relationship between the Slutsky Equivalent Variation (SEV) measure of the gains from trade and the Hicksian Equivalent Variation (HEV) measure, and between the DDN measure of the gains from trade and the SEV measure, which we learned in class in general satisfy $DDN \geq SEV \geq HEV$.

(a) First, we are asked to show that $SEV = HEV$ if a country's preferences are Leontief (i.e., right-angle indifference curves). This is confirmed in the figure below:



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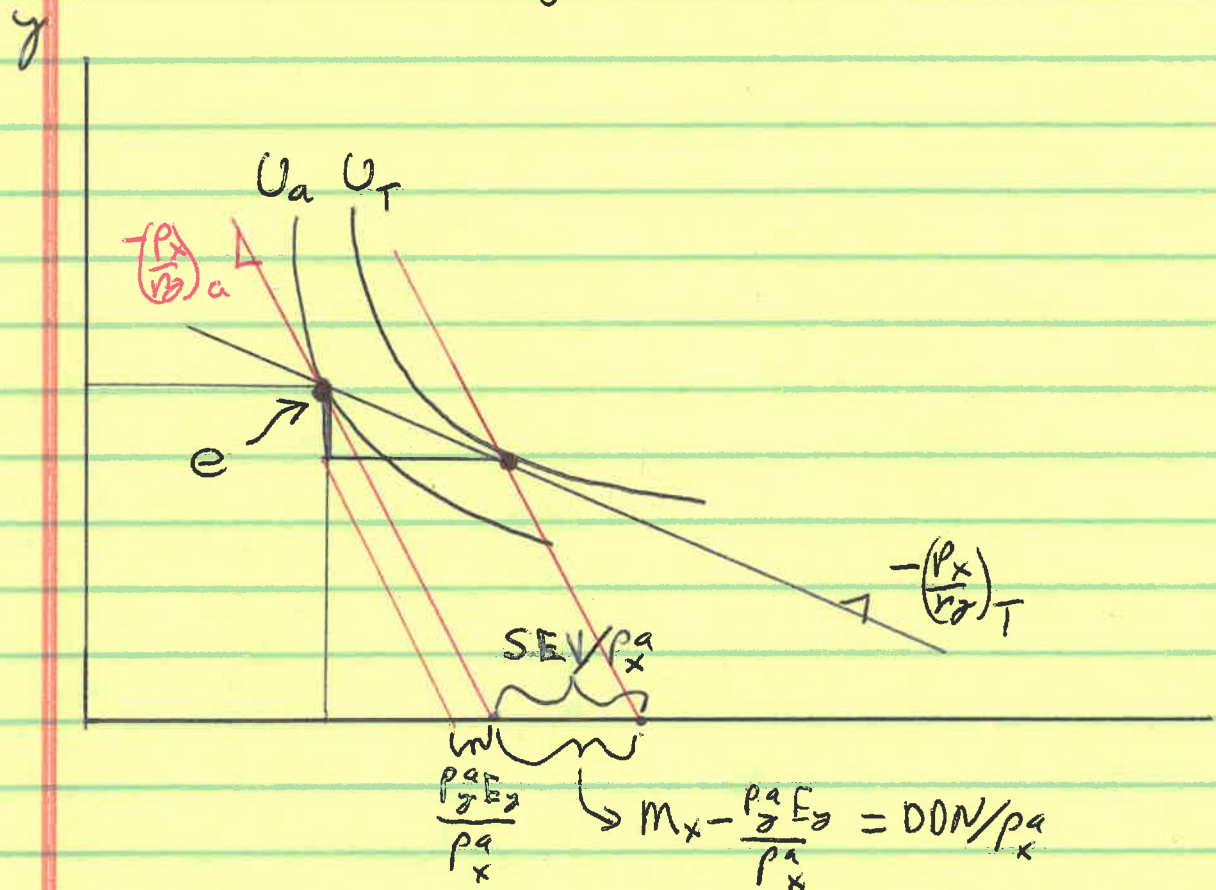
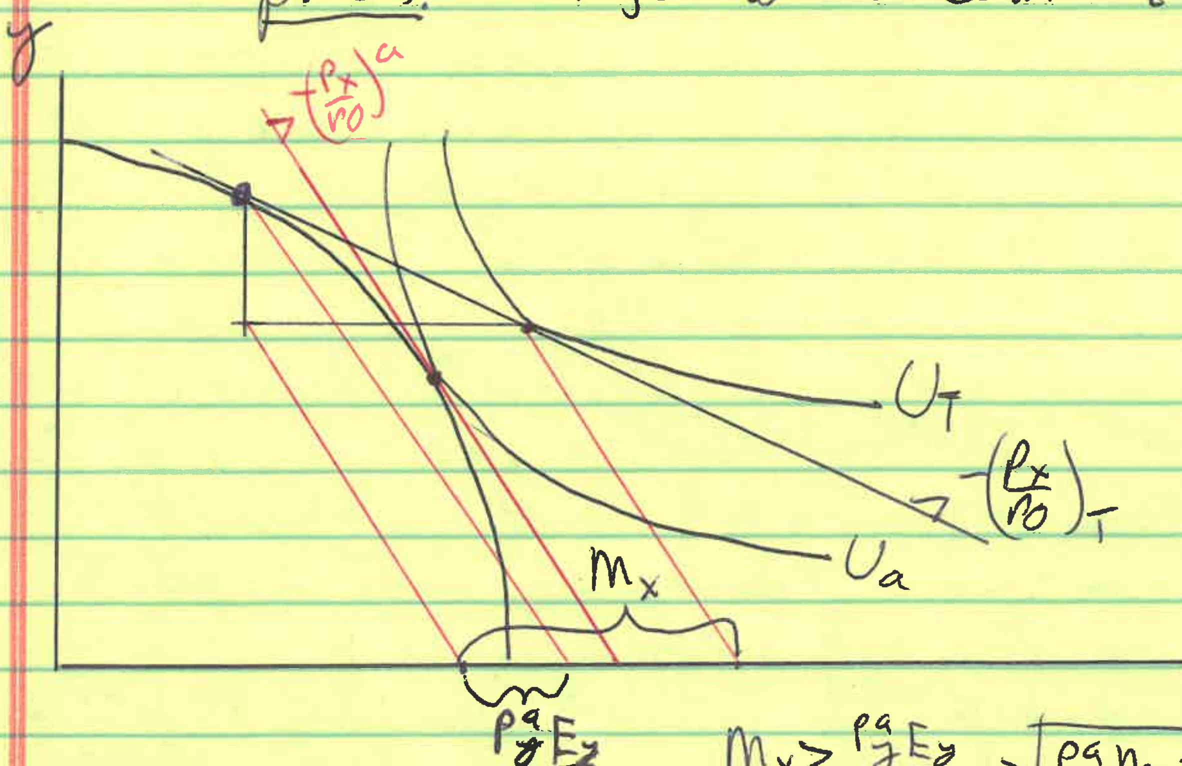
(b) Next we are asked to show that DDN = SEV if a country's production is fixed (it acts like an exchange economy). This is confirmed on the figure below:



2. We are asked to use the Basic Trade Model to answer 2 questions about a puzzling feature about the gains from balanced trade, namely that a country could gain from this trade when the value of what it receives from ~~th~~ other countries (its imports) is exactly equal under balanced trade ~~to~~ to the value of what it gives up

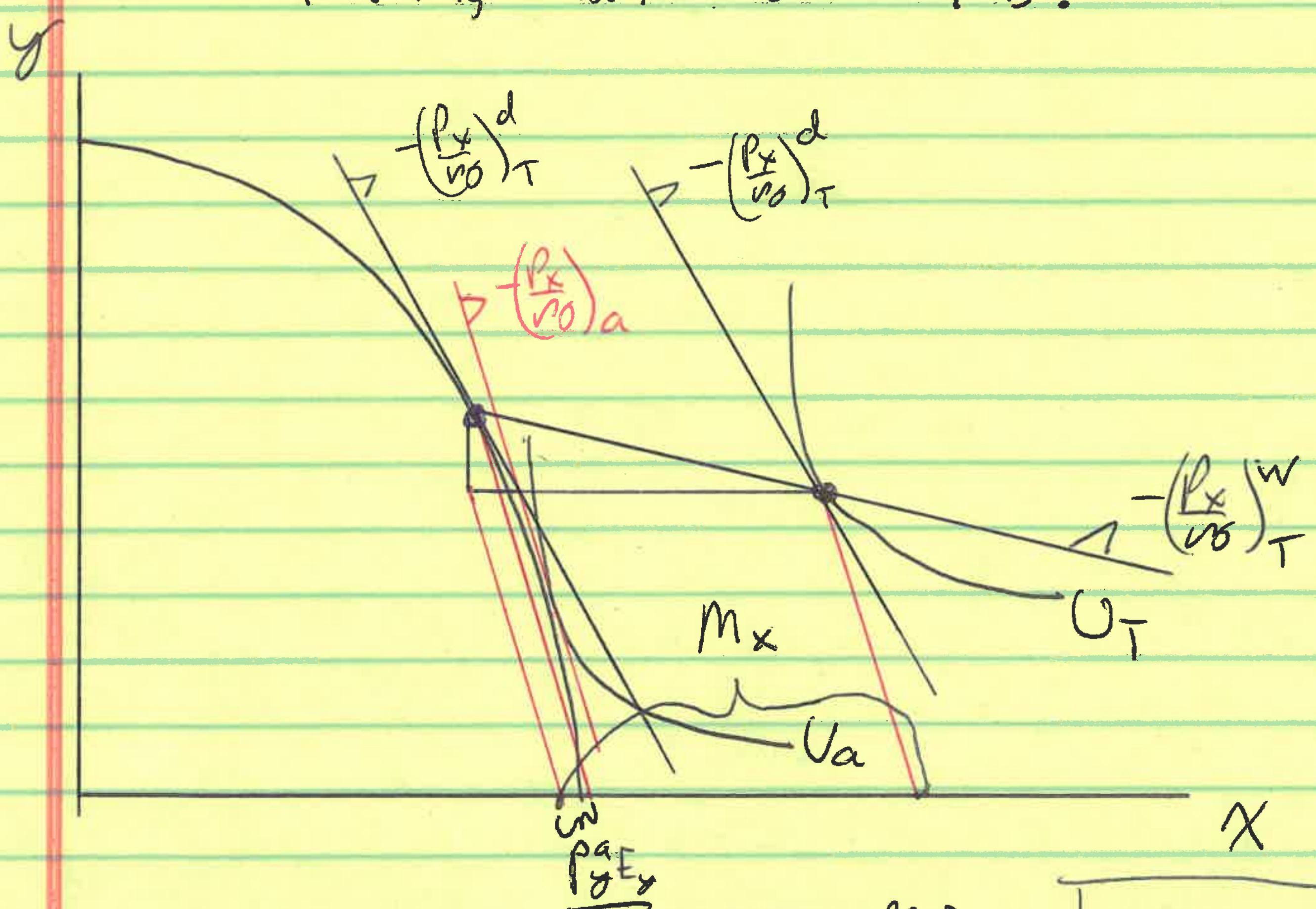
(its exports) in exchange, when the valuation is done with the prices at which the countries trade. We are asked to show in two circumstances that this puzzle can be resolved by valuing the trades at the "right" (i.e. *autarky*) prices.

(a) The first circumstance is when the country is engaged in *free* and balanced trade with the ROW. We are asked to confirm that the value of the country's imports, valued at its *autarky prices*, is greater than the value of its exports, valued at its *autarky prices*. The figure below confirms this:



$M_x > \frac{P^a_y E_y}{P^a_x} \Rightarrow \boxed{P^a_x M_x > P^a_y E_y}$

(b) The second circumstance is when the country imposes a non-prohibitive tariff on its imports. We are again asked to confirm that the value of the country's imports, valued at its autarky prices, is greater than the value of its exports, valued at its autarky prices. The figure below confirms this:



$$M_x > \frac{P^a_y E_y}{P^a_x} \Rightarrow \boxed{P^a_x M_x > P^a_y E_y}$$