Universität Zürich[UZH]

Topic 11 – Aggregate Trade Imbalances

Prof. Ralph Ossa

Introduction

- So far, our models have always implicitly ruled out aggregate trade imbalances in the sense that total exports always equaled total imports

- In this lecture, we relax this assumption and take a look at the determinants of aggregate trade imbalances

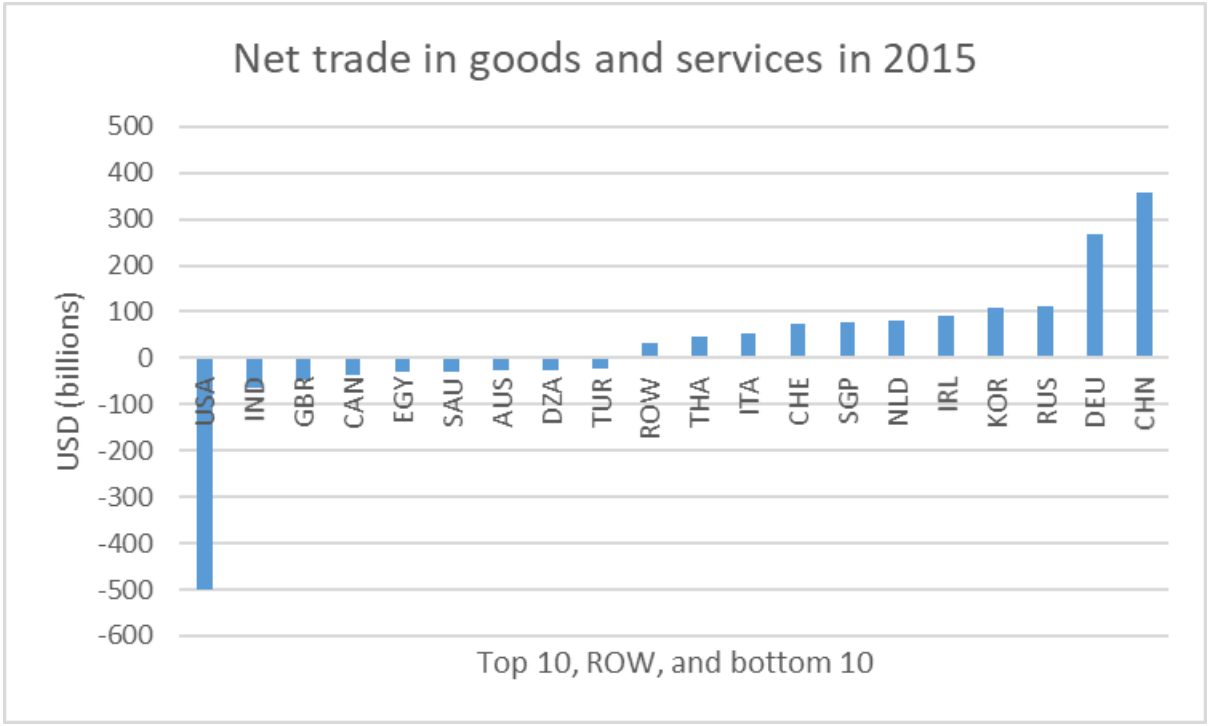
- Aggregate trade imbalances have come to dominate the recent trade policy discussion, with US President Trump equating trade deficits with “bad deals”

- Maximizing trade surpluses was also the goal of mercantilism, which guided trade policy making in Europe between the 16th and 18th century

Overview of the lecture

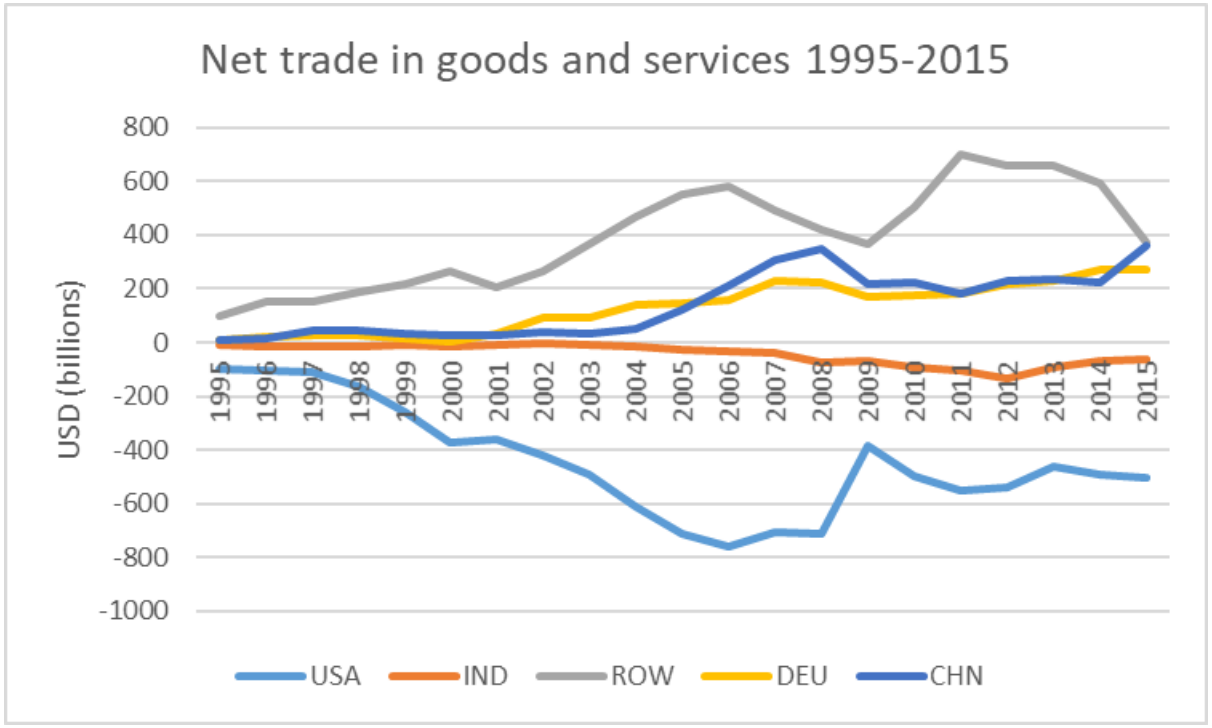
- Basic facts
- Definitions
- A simple model
- The case of China
- The role of trade costs

Basic facts – Aggregate trade imbalances are large



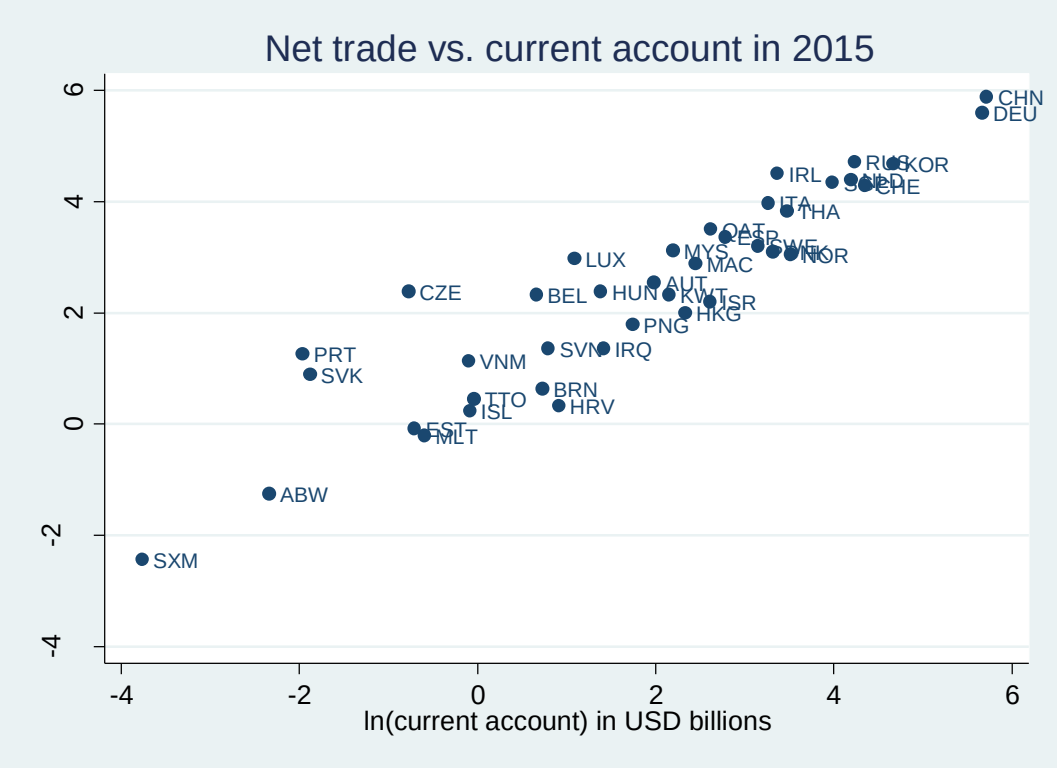
Source: World Bank

Basic facts – Aggregate trade imbalances have grown over time



Source: World Bank

Basic facts – Trade and current account balances are very similar



Source: World Bank

Definitions – Current account

- The **current account** (denoted by CA) measures the change in a country's net foreign asset position (denoted by B), i.e. a country's additional international borrowing or lending:

$$CA_t = B_{t+1} - B_t$$

- It is the difference between national savings (denoted by S) and domestic investment (denoted by I) because national savings can be used to accumulate either domestic or foreign assets:

$$CA_t = S_t - I_t$$

- In general, national savings are the difference between national income (consisting of domestic income Y, returns to foreign assets rB, and international transfers T) and national consumption (consisting of private consumption C and government consumption G) so that

$$CA_t = (Y_t + r_t B_t + T_t - C_t - G_t) - I_t$$

Definitions – Trade balance

- The **trade balance** (TB) measures the difference between a country's exports and imports which can be written as:

$$TB_t = Y_t - C_t - I_t - G_t$$

- To see this, split consumption into consumption of domestic goods (C^{dom}) and imported goods (C^{imp}) and notice that exports are simply the difference between domestic supply and demand:

$$TB_t = \underbrace{Y_t - C_t^{dom} - I_t - G_t}_{\text{Exports}} - \underbrace{C_t^{imp}}_{\text{Imports}}$$

Definitions – Current account vs trade balance

- Taken together, this implies that there is a close relationship between the current account and the trade balance:

$$TB_t = CA_t - rB_t - T_t$$

- This simply reflects the fact that trade deficits need to be financed somehow – either by accumulating foreign debt or by receiving foreign income in the form of interest or transfer payments

- As we have seen, the trade balance and the current account closely co-move in the data so that variation in rB and T does not matter too much

- Trade balances are mainly a reflection of international savings and investment decisions and not indicative of whether a country has struck “bad deals”

Model overview

- Following the analysis of Chapter 1 in Obstfeld and Rogoff (2002) , we now consider a simple model of the current account which allows us to go beyond these basic accounting identities

- At first, this model looks quite different from the models we have seen earlier since it is a dynamic model featuring two time periods

- However, we will see that it actually has a similar interpretation once we understand that the current account is fundamentally about **intertemporal trade**

- For example, if a country runs a current account deficit today and a current account surplus tomorrow it essentially imports today's good and exports tomorrow's good

Model overview (contd.)

- We start with a simple endowment economy in which consumers make consumption and savings decisions

- Our main insight from this basic model will be that consumers' desire to smooth consumption is one factor driving the current account

- We then extend the model to a production economy in which firms also make investment decisions (we abstract from government consumption and transfers throughout)

- Our main insight from this extended model will be that firms' incentive to exploit profitable investment opportunities is another factor driving the current account

Basic model - Setup

- A small open economy produces and consumes a single product over two time periods and we denote the respective outputs and consumptions by Y_1, C_1, Y_2, and C_2

- By small open economy we mean that Home takes as given a world interest rate r at which it can freely borrow or lend from or to the Rest of the World

- For now, we treat the outputs Y_1 and Y_2 as exogenously given and abstract from investment, government consumption, and international transfers

- Since the economy only exists for two time periods, we also assume that households do not own any foreign assets in the beginning or end, which amounts to imposing $B_1 = B_3 = 0$

Basic model – Current account

- Given that $B_1 = B_3 = 0$, our earlier relationship $CA_t = B_{t+1} - B_t$ immediately implies $CA_1 = B_2$ and $CA_2 = -B_2$ so that:

$$CA_1 = -CA_2$$

- Over any stretch of time, a country's cumulative current account balance is the cumulative change in its net foreign asset position, which we assume to be zero here

- Given our assumption of no investment, government consumption, and transfers, our relationship $CA_t = (Y_t + rB_t + T_t - C_t - G_t) - I_t$ simplifies to:

$$CA_1 = Y_1 - C_1$$

$$CA_2 = Y_2 + rB_2 - C_2$$

Basic model – Preferences and budget constraint

- Consumers have additively separable preferences with a subjective discount factor β, $0 \leq \beta \leq 1$, which measures their impatience to consume:

$$U = u(C_1) + \beta u(C_2)$$

- We assume that the period utility function $u(C_i)$ is strictly increasing and concave in consumption:

$$u'(C_i) > 0 \; and \; u''(C_i) < 0$$

- By combining the equations for CA_1 and CA_2 from the previous slide, it is easy to derive the intertemporal budget constraint, which just says that the present discounted value of consumption and income must be the same:

$$C_1 + \frac{C_2}{1+r} = Y_1 + \frac{Y_2}{1+r}$$

Basic model – Utility maximization

- Maximizing utility subject to the budget constraint yields the following first-order condition, which is also known as **Euler equation**:

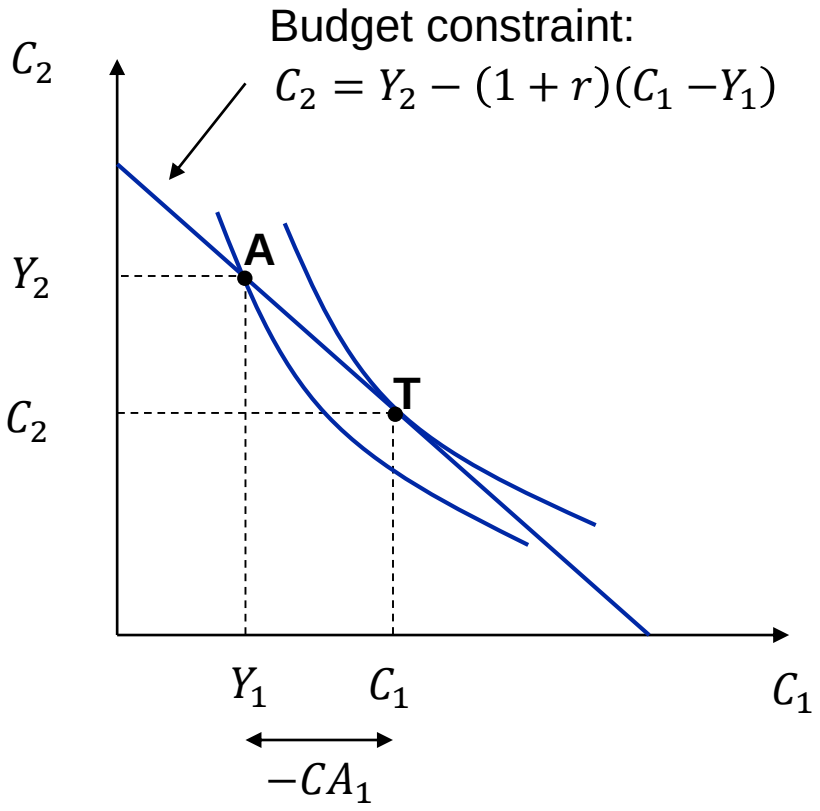
$$u'(C_1) = (1 + r)\beta u'(C_2)$$

- An important implication of this Euler equation is that consumers like to smooth their consumption. This is particularly clear in the special case $\beta = \frac{1}{1+r}$ in which $C_1 = C_2$

- When the subjective time preference rate and the market interest rate differ, the motivation to smooth consumption is modified by an incentive to tilt the consumption path

- As usual, the first order condition can be combined with the budget constraint to solve for the period consumptions (you will see an example in the problem set)

Basic model – Equilibrium



- This graph illustrates an example in which Home would choose to run a current account deficit in period 1
- T denotes the trade equilibrium and A the autarky equilibrium
- As can be seen, there are **gains from intertemporal** trade unless A and T coincide
- As we will see, A and T only coincide if the interest rate is the same under trade and autarky

Basic model – The pattern of intertemporal trade

- Under autarky, consumption must equal production. Together with the Euler equation, this implies that the **autarky interest rate** must satisfy:

$$\frac{1}{1+r^A} = \frac{\beta u'(Y_2)}{u'(Y_1)}$$

- The pattern of intertemporal trade is determined by the difference between the autarky interest rate and the world interest rate

- If $\mathrm{r} < r^A$, saving is less attractive than under autarky so that Home runs a current account deficit in period 1 (as in the previous figure) and vice versa

Basic model – The role of output changes

- In the special case $\beta = \frac{1}{1+r}$, the above formula can be rewritten as follows, which clarifies how output changes affect the pattern of intertemporal trade:

$$\frac{1+r}{1+r^A} = \frac{u'(Y_2)}{u'(Y_1)}$$

- In particular, notice that output changes are now the sole driver of the current account since $Y_2 > Y_1 \Leftrightarrow \mathrm{r} < r^A \Leftrightarrow CA_1 < 0$ and vice versa

- This arises simply because consumers want to smooth consumption (which they actually want to do perfectly in this special case)

- The general insight is that a country's current account is partly driven by its desire to save for bad times or borrow against good times

Extended model – Setup

- We now add a more realistic production side to the model by assuming that output is made from capital which can be accumulated through in investment

- In particular, output depends on the stock of capital as captured by the following production function satisfying $F'(K_i) > 0$, $F''(K_i) < 0$, and $\mathrm{F}(0) = 0$:

$$Y_i = F(K_i)$$

- For simplicity, we abstract from depreciation which implies that all investment adds to the existing capital stock:

$$K_{t+1} = K_t + I_t$$

- Moreover, we assume that capital is freely convertible into output and vice versa and can be “eaten” even after it has been used to produce

Extended model – Current account and budget constraint

- Just like before, we assume that households have no foreign assets at the beginning of period 1 and the end of period 2 so that

$$CA_1 = -CA_2$$

- But given that we now allow for investment, our equations for the current account balances in period 1 and 2 become:

$$CA_1 = Y_1 - C_1 - I_1$$

$$CA_2 = Y_2 + rB_2 - C_2 - I_2$$

- These relationships can again be combined to an intertemporal budget constraint, which now says that income must equal the sum of consumption and investment in present discounted value terms:

$$C_1 + I_1 + \frac{C_2 + I_2}{1 + r} = Y_1 + \frac{Y_2}{1 + r}$$

Extended model – Utility and profit maximization

- Maximizing the utility function subject to the extended budget constraint still yields the same Euler equation:

$$u'(C_1) = (1 + r)\beta u'(C_2)$$

- Maximizing profits subject to the production function implies that the marginal product of capital equals the world interest rate (we take K_1 to be pre-determined):

$$r = F'(K_2)$$

- Intuitively, it makes sense to invest in domestic production as long as the rate of return exceeds that of international bonds

- Recall that output is freely convertible into capital and vice versa so that r is the appropriate opportunity cost

Extended model – Intertemporal PPF

- Given that we now allow for investment, the economy can shift consumption across time periods even in autarky, which was not possible in the earlier endowment economy

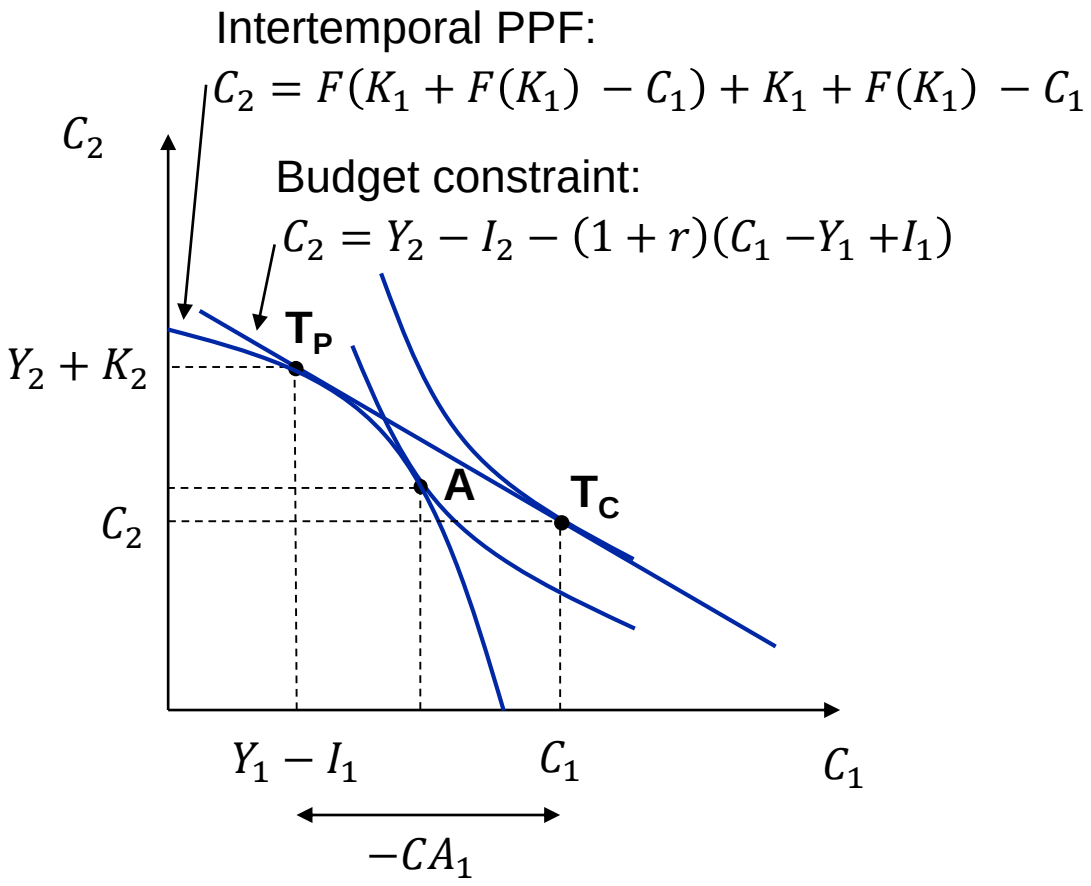
- This implies that there is now an **intertemporal production possibilities frontier**, which shows the technological possibilities available in autarky for transforming C_1 into C_2

- Keeping in mind that capital can be "eaten", it can be derived from the conditions $C_1 = Y_1 - I_1$, $C_2 = Y_2 + K_2$, $I_1 = K_2 - K_1$, $Y_1 = F(K_1)$, and $Y_2 = F(K_2)$ and is given by:

$$C_2 = F(K_1 + F(K_1) - C_1) + K_1 + F(K_1) - C_1$$

- Under trade, it is still relevant because it shows the technologically feasible combinations of output net of investment, which the country can produce and then use for international borrowing and lending

Extended model – Equilibrium



- This graph again illustrates an example in which Home runs a current account deficit in period 1
- A denotes the autarky equilibrium, while T_P and T_C denote production and consumption under trade
- Again, there are gains from intertemporal trade unless A, T_P, and T_C coincide
- But now this is not just due to consumption smoothing because production choices also adjust

Extended model – The role of investment

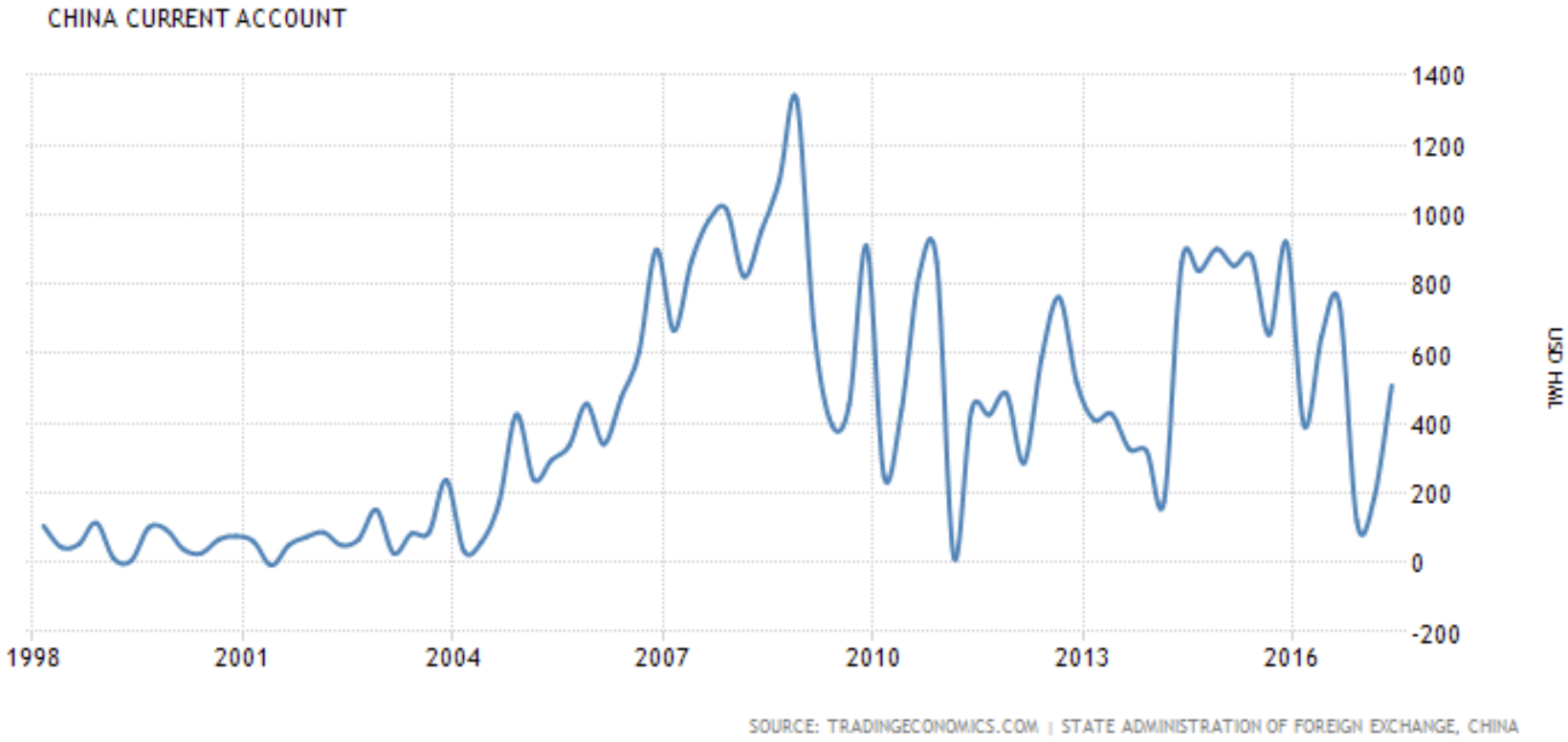
- In the above diagram, the world interest rate is below the autarky interest rate so that it becomes cheaper to borrow under trade

- However, this borrowing is now also used by firms to increase domestic investment and not just by consumers to smooth consumption

- Essentially, the economy has a comparative advantage in period 2 production so that it “imports” good 1 and “exports” good 2

- The general insight is that the current account is partially driven by cross-country variation in the returns to investment which international capital markets then exploit

The case of China



NB: The unit is USD hundred million, so 400 in the graph corresponds to 40 billion

The case of China (contd.)

- China's large and persistent current account surplus seems puzzling in light of our theory since Chinese output is growing relatively fast and Chinese returns to capital are relatively high

- Song et al (2011) suggest credit market imperfections as an explanation, showing that private firms have to accumulate huge savings to finance their operations since banks prefer state-owned companies

- Wei and Zhang (2011) instead point to China's large sex imbalance, arguing that men need to save a lot to become competitive in the marriage market

- There are approximately 122 boys born for every 100 girls in China so that approximately one in five Chinese men will not find a spouse

The role of trade costs

- Recall that current account imbalances tend to be reflected in trade imbalances so that international borrowing and lending go hand in hand with physical trade flows

- This suggests that physical trade costs could also be an important determinant of current account imbalances

- Indeed, Reyes-Heroles (2016) estimates that 69% of the increase in trade imbalances from 1970 to 2007 can be attributed to falling trade costs

- This illustrates the interconnectedness between the globalization of goods markets and the globalization of capital markets in recent decades

Conclusion

- Basic facts
- Definitions
- A simple model
- The case of China
- The role of trade costs

References

- *R. Reyes-Heroles. 2016. "The Role of Trade Costs in the Surge of Trade Imbalances." Mimeo*
- *K. Rogoff and M. Obstfeld. 2002. "Foundations of International Macroeconomics." MIT Press*
- *M. Song, K. Storesletten, and F. Zilibotti. 2011, "Growing Like China". American Economic Review*
- *S. Wei and X. Zhang. 2011. "The Competitive saving Motive: Evidence from Rising Sex Ratios and Savings Rates in China." Journal of Political Economy*