Competitiveness, ‘Superstar’ Firms and Capital Flows: The North-South Divide in Pre-Crisis Europe

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Abstract

This paper proposes a model that links trade competitiveness to current account imbalances through an intertemporal lens. At the core of the model are higher profits generated by the firms in the more competitive economies. On one hand, higher margins of production are associated with less capital per dollar of sales and, thus, lower asset supply. On the other hand, to the extent that profits are distributed to households with a higher propensity to save, higher profit rates translate into higher asset demand. When capital is allowed to flow freely across borders, this results in capital outflows from economies with more competitive firms. I show that the current account imbalances between the Northern and Southern economies on the eve of the Global Financial Crisis map closely to the competitiveness gaps between the states. I construct a quantitative trade model that simultaneously matches the firm-level distributions and trade flows across sectors in eight European economies. The model generates North–South capital flows in the range of −0.9% to 2.5% of GDP per year. I show that most of the profit- and capital flow asymmetry in the model boils down to the higher prevalence of ‘superstar’ firms in the North. I suggest the size-dependent distortions as a proximate explanation for the competitiveness gap, and ultimately, the current account imbalances between the North and South in the decade prior to the crisis.

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1 Introduction

Many in policy circles trace the origins of the devastating European sovereign debt crisis to large current account imbalances that accumulated between its members during much of the 2000s. In turn, the imbalances are often viewed as caused by the lack of competitiveness on the part of the deficit economies. So much so, that in 2011 a Macroeconomic Imbalances Procedure (MIP) was added to the surveillance mechanisms operating within the EU. One of its tasks is the monitoring of the competitiveness of member states as to flag the risk of impeding imbalances. MIP is responsible for corrective policy recommendations, and, in the case of repeated non-compliance, is liable to sanction.

It is remarkable then, that, despite institutional emphasis on the lack of competitiveness as the origin of imbalances, the word “competitiveness” features a total of three times on the 752 pages of Obstfeld and Rogoff’s “Foundations of International Macroeconomics”. Instead, the imbalances are presented, rephrasing Friedman, as everywhere and always an intertemporal phenomenon. This paper proposes a model that links various notions of competitiveness to current account imbalances through an intertemporal lens. I apply it to pre-crisis Europe and ask: what was the role of competitiveness gaps in generating the current account imbalances of the 2000s?

The first contribution of this paper is to outline the stylized facts linking current account imbalances and competitiveness in pre-crisis Europe, distinguishing between three different notions of competitiveness. The first notion of competitiveness follows from examining the composition of “market leaders” – defined as the largest firms in a given industry in the common market – by their country of origin. To do so, I use Orbis Historical, a firm-level dataset with the most comprehensive coverage of both private- and public firms in pre-crisis Europe. I find that Northern economies are over-represented, relative to their size, whereas the Southern economies are under-represented amongst the market leaders across industries. In other words, Northern firms have occupied leading positions in the European trade across a wide range of sectors. The second notion of competitiveness relates to the profit rates. I show that Northern firms have been enjoying systematically higher profit rates in the tradable sector, compared to their Southern counterparts. Finally, the third notion of competitiveness follows from unit labour costs. I use Eurostat data to show that unit labor costs in the tradable sector – a measure that is informative of the relative costs of production – have declined in the Northern economies and have risen in the Southern economies over the years 1998 to 2007. Having thus characterized the competitiveness gap between the North and the South, I show that each of these different measures of competitiveness is predictive of the size of the current account imbalances that the countries have generated in the decade prior to the crisis.

Second, I develop a model that can help rationalize these stylized facts. Competitiveness in the common market translates to the Northern firms commanding higher profits, while the profits of their Southern counterparts are squeezed. To study the profitability in international trade I set up the simplest model of oligopolistic competition that features non-trivial markup dynamics. Firms compete à la Cournot in a manner following Atkeson and Burstein (2008). In this setup,
a firm is competitive/is a market leader if its sales share in the common market is higher than that of its competitors. Market leaders earn higher profits, and economies that generate the most market leaders feature higher aggregate profit rates. Next, I embed this simple model of international competition into a general equilibrium setting, and show that economic profits affect capital markets from both asset supply and asset demand sides. From the asset supply side, higher profit rates result in a smaller optimal scale of production and, thus, a lower capital to GDP ratio. From the asset demand side, I show that if profits accrue to the demographic which has a higher propensity to save, then a higher profit rate increases the demand for assets. I model the two groups as workers, who supply labor and earn wages, and capitalists, who also work but in addition are the recipients of the profits in the economy. To sum up, an economy whose firms compete more successfully in international markets will have a higher aggregate profit rate. This will lead to a lower supply of assets and simultaneously a higher demand for assets, suppressing the autarkic interest rate. Should capital be allowed to flow freely across borders, the more competitive economies will accumulate current account surpluses. The model generates a number of predictions, relating firm-level sales shares and profits on one hand, and sectoral concentration and sectoral profit rates on the other hand. I then provide evidence in support of each of the predictions in the data. To the best of my knowledge, this is the first model to feature permanent differences in competitiveness producing cross-border capital flows.

My third contribution is to quantify the role of the competitiveness gaps in the development of current account imbalances in Europe on the eve of the Global Financial Crisis. In order to do this, I construct a quantitative trade model that simultaneously matches the firm-level distributions and trade flows across sectors in eight European economies. I maintain the Atkeson and Burstein (2008) setup, but now permit costly trade and parameterize the firm distributions to be Pareto. I adopt the household side of the model from Straub (2019): an overlapping generations setup with non-homothetic preferences for saving. The two sources of non-homotheticity in the model are bequests which are treated as a luxury, and a preference for higher spending in old age that increases with income. The two together mean that the richer capitalist households accumulate more assets during their life-cycle. An economy with more income distributed to capitalists thus features a higher demand for savings, similar to the stylized model. I calibrate the household side of the model to match a series of moments describing the asset holdings in different groups of population.

Once the quantitative model is calibrated, I solve it to obtain the capital flows when moving from financial autarky to financial openness. I find that during the transition, the economies accumulate net foreign assets ranging between $-9.2\%$ of GDP to $25\%$ of GDP. Over the course of a decade from 1998 to 2007 this implies current account imbalances in the range of $-0.9\%$ to $2.5\%$ per annum. The model correctly predicts surpluses in Sweden, Finland and Germany and can explain almost half of the surpluses accumulated in the period, and correctly predicts deficits in Italy, Spain and Portugal, albeit with less precision in terms of their respective magnitudes. The model closely matches the tradable sector profit rates in the data and is able to generate a quarter of the unit labor cost divergence seen over the period. Thus, I conclude that the competitiveness gap between the North and the South is an important driver of the current
account imbalances between the two sets of economies.

I conclude by conducting counterfactual experiments to isolate the source of higher competitiveness of the Northern firms and find that the competitiveness gap is not driven by the higher average productivity of the Northern firms. Instead, most of the profit- and capital flow asymmetry in the model boils down to the higher prevalence of ‘superstar firms’ in the North. I suggest the size-dependent distortions as a proximate explanation for the discrepancy between the number of market leaders that Northern and Southern economies generate, and ultimately, the current account imbalances that opened up between the two groups of countries between 1998 and 2007.

1.1 Related literature
This paper forms part of a literature on ‘global imbalances’: a pattern of large and persistent current account deficits in some countries, and current account surpluses in others. In much of the literature, the imbalances are understood as arising from asset market asymmetries in different parts of the world. For example, Caballero et al. (2008) focus on lower supply of assets in the surplus economies due to the lack of developed financial system. Mendoza et al. (2009) and Ferrero (2010), instead, explain the imbalances as caused by the differences in asset demand, e.g. due to the amount of idiosyncratic risk faced by households or demographic pressures. The majority of papers in the literature of global imbalances address the ‘allocation puzzle’: the observation that, globally, capital tends to flow from emerging economies to advanced countries. Thus, the focus tends to be on the experiences of Asia, on one hand, and the US, on the other: economic regions responsible for the majority of the global capital flow. My paper differs from this existing literature by studying the experiences of countries within Europe, which can all be considered advanced. In order to generate capital flows in economies with similar levels of financial development and demographics, I introduce a new source of asset market asymmetry: the share of the economy that is constituted by pure profits.

A closely related strand of literature charts ‘secular stagnation’: a global decline in natural interest rates. Whereas global imbalances literature focuses on differences between asset markets across countries, secular stagnation literature, for its part, focuses upon how global asset markets change over time. A number of recent contributions have linked declining interest rate with a trend of rising market power (De Loecker et al. (2020), Liu et al. (2019)). The mechanism in my paper, whereby higher profit rates suppress asset supply, functions similarly. Mian et al. (2020), instead, link declining interest rates to growing inequality. The mechanism in their paper relies on heterogeneities in saving behaviour of different population groups. In my paper a similar mechanism links profit rates, through the higher propensity to save by the recipients, to higher asset demand. In my paper, the two mechanisms are brought into motion through trade in imperfectly competitive markets and are the driver of cross-border capital flows.

The central element of my model is heterogeneous profit rates which arise due to oligopolistic competition in international varieties markets. Recently, there has been a resurgence in the use of oligopolistic competition models to study the behaviour of markups in both macroeco-
nomics (Edmond et al. (2018), Burstein et al. (2020)) and trade literature (Bernard et al. (2003), Atkeson and Burstein (2008), Gaubert and Itskhoki (2018)). Among the latter, closest to my work are Edmond et al. (2015) and De Blas and Russ (2015), studying how aggregate markups and profits respond to trade liberalization. In my paper, aggregate profits are similarly shaped by competition in the international markets. However, I focus on an episode of financial liberalization instead and ask how does the market power asymmetry, at a country-level, shape international capital flows.

A number of papers have focused on the nexus of capital flows, trade and TFP. Gopinath et al. (2017), Benigno and Fornaro (2014) and Reis (2013) argue that capital inflows can lead to declines in TFP due to the large capital inflows increasing the misallocation of capital. However, in these papers, capital flows are exogenous. Instead, I study how exogenous differences in firm productivity shape capital flows. The closest paper to mine is Jin (2012). In it, differences in comparative advantage shape the capacity to absorb capital, which generates capital flows in response to trade liberalization. However, the underlying mechanism in my paper is very different: I postulate no differences in capital intensity across sectors. Instead, asset markets are affected by how profit rates respond to trade between economies with different productivity distributions.

Finally, the application in this paper addresses the debate on the origins of the current account imbalances in pre-GFC Europe. The classical “convergence flows” explanation, as summarized in Blanchard and Giavazzi (2002), was called into question by Giavazzi and Spaventa (2011). Fornaro (2019) links capital flows to the creation of the monetary union, but takes the initial interest rate asymmetry as given. This paper can be seen as offering an explanation as to how the interest rate asymmetry arose in the first place.

The remainder of this paper is organized as follows. Section 2 presents the stylized facts linking trade competitiveness, profit rates and capital flows. Section 3 presents a two-country stylized model where imperfect competition in international markets generates capital flows. In Section 4, I present the fully fledged quantitative trade model with asset markets and discuss calibration. Section 5 presents the results of the quantitative model and studies how the competitiveness gaps shaped capital flows within Europe on the eve of the Global Financial Crisis. Section 6 concludes.

### 2 Stylized facts

In this section, I first discuss the dynamics of current account imbalances in Europe over the years 1995 to 2008; then I consider the competitiveness gap between the North and the South; and, finally, I argue that the relative performance in international trade is predictive of the current account positions over the period.

**Stylized fact 1: Current Account Imbalances in Europe, 1995 to 2008**

From the mid-90’s Europe underwent a period of financial liberalization, involving wide ranging legal and regulatory harmonization in the financial markets and, ultimately, adoption of the Euro by twelve economies in 1999-2001. The increased financial integration between the European
states has led to an opening of current account imbalances. Two observations are in order with regards to the imbalances in Europe. First, there was a clear geographic split between the deficit and surplus economies: over the period, Northern economies (Sweden, Netherlands, Germany, Austria, Finland, Belgium, Denmark and France) have accumulated current account surpluses, while as Southern economies (Greece, Italy, Spain and Portugal) have instead been running (increasingly large) current account deficits. Figure 1, below, presents the group average current account to GDP ratio for the two groups. At the pre-crisis peak, in 2006, the imbalances constituted 4.5% of the GDP, on average, in the North group and −8% of GDP in the South group. Second, the imbalances were very persistent. Out of eight Northern economies, six – with the exception of Germany and Austria – were in surplus every year between 1999 and 2007. Germany and Austria ran surpluses from 2002 onward. Meanwhile, Greece, Spain and Portugal have been running deficits from 1994 to 2007 inclusive, with Italy joining in 2004.

Figure 1: Current Account Imbalances in Europe

North: Germany, Netherlands, Sweden, Denmark, Belgium, Finland, Austria, France
South: Italy, Spain, Portugal, Greece

Stylized fact 2: Competitiveness Gap between the North and the South
There is no broad agreement on what the word competitiveness means. In the literature, it most often refers to some measure of the relative costs of production, reflected either in the relative unit labor costs or in the real exchange rate. However, inasmuch as the factor prices are endogenous, it is not clear that competitiveness reflected in the costs of production can be viewed as a fundamental characteristic of an economy. In order to overcome this difficulty, I present three different and inter-related statistics that reflect the countries trade competitiveness, understood broadly as the ability to outperform competitors in international markets. I spell
out the relationship between the different concepts in Section 3.

To compare performance of firms in different European economies I need a firm level dataset with widest possible coverage. For this I am using Orbis Historical by Bureau van Dijk Electronic Publishing: the best publicly available database for comparing firm panels across countries (Kalemli-Ozcan et al. (2015)). The dataset covers millions of firms in Europe and, crucially, covers both private and public firms. Despite this, the coverage still varies by country and year. To address the issue of representativeness, I work with the sample recommended by Bajgar et al. (2020), focusing on Belgium, Germany, Finland, France, Italy, Portugal, Spain and Sweden in year 2007 – a year with the best coverage. To study competitiveness in international trade, I restrict my attention to the tradable sectors only. The detailed description of the data can be found in Appendix A.

My first metric of competitiveness in international trade reflects the prevalence of the countries firms among “market leaders” – defined as the set of largest firms in a given industry in the common market. To quantify this, I suggest the following thought experiment. Consider the share of output produced by firms originating in any one country. This would be roughly proportional to the country’s GDP. Now, suppose we only look at market leaders, i.e. the biggest firms in any one industry. Will each economy be represented in proportion to its size?

Table 1 presents the prevalence of market leaders in each of the eight economies. The first column in the table reports the country’s sales in the tradeable sectors as a share of the eight economies total. The sales data comes from the sectoral national accounts and thus covers all firms in the respective sectors. The second column is the share of sales – in my restricted Orbis sample – represented by firms from each of the economies. Barring France and Germany, the numbers in the first two columns are close, indicating that sample representativeness is not a major problem with, the exception of these two economies.

What if we now restrict our attention to the sample of market leaders? Let a firm be a market leader if it is one of the Top-100 largest producers in its 4-digit industry. What share of sales in this restricted sample of firms is represented by firms from each of the eight economies? This statistic is recomputed for narrower and narrower definitions of market leaders in columns (4) to (7). Relative to their size, Germany, Finland and Sweden are overrepresented in the e.g. Top 5 firms in any one industry, while as Italy, Spain and Portugal are noticeably underrepresented.

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2One concern when studying the relationship between the prevalence of market leader firms in an economy and current account imbalances is that many large firms are multinationals. This introduces two potential problems for the analysis. First, multinational firms are known to engage in profit shifting: a practice of moving the profits made elsewhere into a tax haven. This typically involves misreporting of intra-firm cross-border trade and financial flows. However, Hebous et al. (2021) show that due to the double entry nature of the current account, profit shifting distorts the components of the current account, but not its overall balance. Thus, current account imbalance statistics are invariant to the profit shifting activity of multinational firms. Second, multinational firms generate profits in different countries of operation. Should the profits generated by a subsidiary be attributed to the country of sale or the country where the headquarters are based? Orbis provides statistics for both scenarios: for many multinational firms both consolidated accounts (where profits are ultimately reported as accruing to the headquarter) and unconsolidated accounts (where profits are booked to the subsidiary). The choice depends on the nature of the question studied. For the purposes of the model described in this paper, the correct measure comes from consolidated accounts.

3The reason the firm sales shares would not be exactly proportional to GDP is that GDP also reflects non-firm production, for example government services.
To see this more clearly, in Figure 2 I plot the results from the table, normalizing each country’s share to 1 in the full sample. What emerges from the exercise is that German and Finnish firms are twice as likely, and Swedish firms are 60% more likely to be amongst the top five firms in any one industry than the size of the country would suggest. Meanwhile, the prevalence of firms from Italy, Belgium, Spain and Portugal amongst the market leaders is one fourth of what their size would suggest. In other words, Norther economies disproportionally produce market leaders across industries, while as Southern firms are noticeably underrepresented.

Table 1: Market Leader Firms by Country of Origin

<table>
<thead>
<tr>
<th>Country</th>
<th>All Firms</th>
<th>Full Sample</th>
<th>Top-100</th>
<th>Top-50</th>
<th>Top-10</th>
<th>Top-5</th>
<th>Top-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>37.4</td>
<td>18.5</td>
<td>29.1</td>
<td>29.9</td>
<td>33.9</td>
<td>36.8</td>
<td>41.7</td>
</tr>
<tr>
<td>Finland</td>
<td>2.6</td>
<td>3.4</td>
<td>3.6</td>
<td>3.7</td>
<td>4.3</td>
<td>4.8</td>
<td>7.5</td>
</tr>
<tr>
<td>Sweden</td>
<td>4.4</td>
<td>4.9</td>
<td>7.5</td>
<td>7.7</td>
<td>7.5</td>
<td>6.7</td>
<td>8.0</td>
</tr>
<tr>
<td>France</td>
<td>17.6</td>
<td>34.5</td>
<td>30.2</td>
<td>30.9</td>
<td>34.1</td>
<td>34.2</td>
<td>33.1</td>
</tr>
<tr>
<td>Italy</td>
<td>19.5</td>
<td>21.6</td>
<td>17.0</td>
<td>16.0</td>
<td>12.4</td>
<td>10.1</td>
<td>6.4</td>
</tr>
<tr>
<td>Belgium</td>
<td>4.8</td>
<td>6.1</td>
<td>3.4</td>
<td>3.3</td>
<td>2.8</td>
<td>2.8</td>
<td>1.7</td>
</tr>
<tr>
<td>Portugal</td>
<td>1.8</td>
<td>1.2</td>
<td>1.1</td>
<td>0.9</td>
<td>0.4</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Spain</td>
<td>11.9</td>
<td>9.8</td>
<td>8.3</td>
<td>7.5</td>
<td>4.6</td>
<td>4.2</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Figure 2: Market Leader Firms by Country of Origin

Note: on the y-axis I measure the share of firms in the given slice of the sample (where ‘Sample’ stands for full Orbis sample I work with and ‘Top-x’ is the sub-sample with only top x largest firms in any one 4-digit industry retained) that are domiciled in a given country, normalized by the share of the sales represented by firms from the country in the full sample.
Another way to think about competitiveness in international trade is to link it with the profits that the firms make. In models of imperfect competition, being productive both results in large market shares and high firm-level profit rates. Thus, profit rates in the tradable sectors of the economy can proxy for the relative success of its firms in the international markets.

I obtain my measures of firm profitability from two sources. First, I compute profit rates at a firm level in my Orbis sample by dividing the ‘Profit (Loss) for Period’ variable by the ‘Operating Revenue / Turnover’ and multiplying through by 100. Second, I use the operating profit to revenue variable from CompNet, a dataset compiled by the ECB from the firm-population level data sourced from Central Banks and National Institutes. Compnet reports data at a 2-digit NACE level. I aggregate my two measures at a country level, weighting by revenue. To attain maximum coverage, for each country I pick the longest coverage from either of the two datasets.

Panel (a) of Figure 3 below shows the group average profit rates in the tradable sectors for a sample of Northern and Southern economies. In each of the years, profit rates in the North are double that of in the South, which is, again, suggestive of the better ability to compete in the international markets proper to Northern firms compared to their Southern counterparts.

Finally, I also present the evolution of the unit labor costs in the tradable sector across the two groups of countries between years 1998 and 2007. Unit labor costs are informative of the costs of production. Inasmuch as firms enjoy lower costs of production at the prevailing output prices, they can beat competition by offering a lower price for their goods. I use the Eurostat Unit labor Costs (based on hours worked) series for agriculture, industry (except construction) and manufacturing, and aggregate up using the sector value added as shares. The series is an index, with year 1998 value set to 1. Panel (b) of Figure 3 presents the sample average ULC indices.
for the Southern and the Northern economies. Over the period between 1998 and 2007, tradable sector unit labor costs have declined somewhat in the North, but have risen substantially in the Southern economies.

**Stylized fact 3: Competitiveness Gap and Current Account Imbalances**

Finally, I argue that the ability to compete in international markets is related to the current account position that countries in Europe have attained in the pre-crisis period. I collect the average profit rates in the tradable sector in years 2006-2007, two years with the best coverage, and plot them against the average current account imbalance between years 2001 to 2007. The result can be seen in Panel (a) of Figure 4: there is strong association between competitiveness in the international markets, as proxied by firm profitability in the tradable sector, and country’s current account position. I also plot the prevalence of market leaders from any one origin against country’s current account. To do this, I pick the statistic I computed for Figure ?? for the Top-5 firms definition of market leaders (the metric I use is the ratio of firms from a given origin as a share of Top-5 firms in any one industry, divided by the share of firms from that origin in the sample, thus controlling for country size). The results can be seen in Panel (b) of Figure 4: once again, there is strong correlation between the current account imbalances on one hand, and firm competitiveness, as measured by the prevalence of the country’s firms amongst the market leaders, on the other. Finally, panel (c) of Figure 4 presents the changes in the unit labour costs between years 1998 and 2007 for a set of European economies. Note that the observations are too few to draw statistical inferences and that the plots reveal simple correlation. Nevertheless, this observation is one step in the direction of understanding the link between trade competitiveness and capital flows.

Figure 4: Competitiveness Gap and Current Account Imbalances

Panel (a) Profit rate, percentage points vs. Average CA imbalance in 1998-2007, pp

Panel (b) Market leaders vs. Average CA imbalance in 1998-2007, pp

Panel (c) Change in ULC vs. Average CA imbalance in 1998-2007, pp

Note: in Panel (a) the profit rates are for year 2007. In Panel (b) on the y-axis I measure the share of firms in the sample of the top 5 firms in any 4-digit industry that are domiciled in a given country, normalized by the share of the sales represented by firms from the country in the full sample, data for 2007. In Panel (c) on the y-axis I measure the change in the unit labour costs index between years 1998 and 2007.
3 Stylized model

In this section I derive two results. First, I show that when international trade is imperfectly competitive, aggregate profit rate in the economy depends on the competitiveness of its firms in international markets. Second, I show that a high aggregate profit rate suppresses the autarkic interest rate. The two, in turn mean, that when two regions undergo financial liberalization, the one with firms better poised to compete in the common market will accumulate current account surpluses. I complete the section by discussing the empirical evidence for the firm- and sector-level predictions of the model.

3.1 Firms in the common market

The baseline model comes from Atkeson and Burstein (2008). Consider two economies: home and foreign (the foreign variables will be marked by asterisks). Each contains $N$ firms, which produce differentiated intermediate goods. Firms are indexed by $n \in N$, produce using capital and labor, and are heterogeneous in their productivity $a_n$. The production functions are Cobb-Douglas:

$$q_n = a_n k_n^{ \alpha} l_n^{1- \alpha}.$$

Intermediate goods can be traded costlessly across states. The intermediate goods are combined into a final good by a final good producer, using a CES technology with an elasticity of substitution $\sigma > 1$:

$$Q = \left[ \sum_{n \in M} q_n^{\frac{\sigma-1}{\sigma}} + \sum_{n^* \in M^*} q_n^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}},$$

where $M, M^*$ are the subsets of firms that operate in equilibrium. The final good market is perfectly competitive. The final good is non-tradable.

The finite number of firms results in oligopolistic competition structure in the intermediate goods market. I assume that firms compete on quantity, à la Cournot. Atkeson and Burstein (2008) show that in this case, firm prices and sales shares are jointly determined by the firm profit maximization conditions and the final good producer demand for intermediate goods:

$$P_n = \frac{\sigma-1}{\sigma} \frac{c_n}{1-s_n}, \quad \text{where} \quad c_n = \left( \frac{w}{1-\alpha} \right)^{1-\alpha} \left( \frac{r}{\alpha} \right)^{\alpha} \frac{1}{a_n},$$

and $s_n$ is firm $n$’s sales share in the final good producer’s expenditure:

$$s_n = \frac{P_n^{1-\sigma}}{\sum_{n \in M} P_n^{1-\sigma} + \sum_{n^* \in M^*} P_n^{1-\sigma}}. \quad (1)$$

Firms with lower production costs $c_n$ have higher sales shares and higher markups. For brevity, I assume that there are no entry or operation fixed costs. This means that all $N$ firms at home and abroad operate in equilibrium: $M = M^* = N$. Firm profit rate, i.e. the share of profits in
its sales, is linear in firm’s sales share:

\[ \pi_n = \frac{\Pi_n}{P_n q_n} = \frac{P_n q_n - c_n q_n}{P_n q_n} = 1 - \frac{c_n}{P_n} = \frac{1}{\sigma} + \frac{\sigma - 1}{\sigma} s_n. \]  

(2)

## 3.2 Closing the model

The model is closed by pricing the factors of production: capital and labor. Capital is used in production of intermediate goods, with demand satisfying the optimality conditions of the firms:

\[ rk_n = \alpha c_n q_n = \alpha (1 - \pi_n) P_n q_n. \]

Aggregating across firms,

\[ rK = \sum_N \alpha (1 - \pi_n) P_n q_n = \alpha Y (1 - \pi), \]  

(3)

where \( \pi \) is the aggregate profit rate in the economy:

\[ \pi = \frac{\sum_{n \in N} \Pi_n}{\sum_{n \in N} P_n q_n}. \]  

(4)

Capital is supplied by the households, who hold it as an asset. There are two types of households in the economy: workers and capitalists, of measure \((1 - \mu)L\) and \(\mu L\) respectively. Workers supply labor and earn labor income \(w\). Capitalists also work and earn wages, but, in addition, they are the recipients of the firm profits. Firm ownership is pooled across the capitalist households, so each receives \(\Pi_{\mu L}\).

For the purposes of the stylized model, I characterize households by an asset demand that is proportional to their per-capita, non-financial income by a factor \(\zeta_i\):

\[ a_w = \zeta w, \quad a_c = \zeta_c (w + \frac{\Pi}{\mu L}), \]  

(5)

where \(a_w\) and \(a_c\) are assets held by each household in the worker and capitalist parts of the population. I assume that \(\zeta_c > \zeta_w\). This setup, in a reduced form, captures the idea that asset demand is non-homothetic: the richer, in per-capita terms, capitalist households demand more assets as a share of their non-financial income. This idea has a rich history in economics, dating back to Fisher (1930) and Keynes (1936), and has been supported empirically (Dynan, Skinner and Zeldes (2004), Straub (2018), and Fagereng, Holm, Moll and Natvik (2019)). It has recently made a return as an explanation for the global fall in natural interest rates, referred to as “secular stagnation”. There are many possible reasons for the asset demand to feature non-homotheticity. E.g., De Nardi (2004) models it as arising due to the households treating bequests as a luxury good, while Straub (2018) finds that each of non-linear social security system, non-homothetic preferences for bequests and non-homothetic preferences for the distribution of consumption across periods play a role in explaining the disproportionate asset holdings of the rich. Since
such non-homothetic asset demand functions do not give rise to closed form policy functions, I defer a full specification of a non-homothetic asset demand until Section 4, and for now replace it with behavioural equations in (5). As will be shown in Section 5, the fully fledged model, in aggregate, behaves very similarly to this reduced specification.

Aggregating across households yields the asset demand $A$:

$$A = \mu L a_c + (1 - \mu) L a_w = \mu L \zeta_c (w + \frac{\Pi}{\mu L}) + (1 - \mu) L \zeta_w w.$$ 

Suppose that capital cannot cross borders. In this case, autarkic interest rate $r_a$ clears the capital market at home:

$$K = \alpha \frac{r_a}{Y} Y (1 - \pi) = \mu L \zeta_c (w + \frac{\Pi}{\mu L}) + (1 - \mu) L \zeta_w w = A.$$ 

Wage ensures the labor supplied by the households satisfies the labor demand of the firms exactly:

$$w L = \sum_N (1 - \alpha) c_n q_n = (1 - \alpha) Y (1 - \pi). \quad (6)$$ 

The foreign is symmetric and yields a symmetric factor and asset demand curves, where asterisks mark foreign variables.

Finally, I normalize the global expenditure to 1:

$$Y + Y^* = 1. \quad (7)$$ 

### 3.3 Profit rates, interest rates and capital flows

Consider the capital markets under financial autarky. The autarkic interest rate clears the domestic asset market:

$$K = \frac{\alpha}{r_a} Y (1 - \pi) = \zeta_c (\mu (1 - \alpha) (1 - \pi) + \pi) Y + \zeta_w (1 - \mu) (1 - \alpha) (1 - \pi) Y = A,$$

where the right-hand side has the per-capita income of the workers and capitalists expressed as a share of GDP using equations (4) and (6). Note that in presence of non-zero profits, both the capital demand (thus, asset supply) and household savings (thus, asset demand) are functions of the aggregate profit rate. This result is key, so it is worth discussing the intuition behind it.

Aggregate capital demand, when expressed as a share of GDP,

$$\frac{K}{Y} = \frac{\alpha}{r_a} (1 - \pi),$$

is nothing other than the optimal scale of production at the economy level. Similar to a firm-level result, an economy that derives a larger part of its income in a form of pure profits will have a smaller capital stock, given its size and the factor prices. This is a standard inefficiency associated with firms having market power.
Aggregate asset holdings as a share of GDP,

\[ \frac{A}{Y} = \zeta_c(\mu(1-\alpha)(1-\pi) + \pi) + \zeta_w(1-\mu)(1-\alpha)(1-\pi), \quad \frac{d\frac{A}{Y}}{d\pi} < 0 \quad (8) \]

can be thought of as the weighted average asset holdings in the economy. A higher profit rate redistributes the income in the economy towards the capitalists and, therefore, towards the demographic with a higher demand for assets, raising the aggregate.

Higher aggregate profit rate simultaneously suppresses the asset supply, as a share of GDP, and increases the demand for assets, as a share of GDP. Both effect a decline in the autarkic interest rate:

\[ r_a = \frac{\alpha(1-\pi)}{\zeta_c(\mu(1-\alpha)(1-\pi) + \pi) + \zeta_w(1-\mu)(1-\alpha)(1-\pi)}, \quad \frac{dr_a}{d\pi} < 0. \quad (9) \]

This is the first result of the model.

**Proposition 1:** Higher aggregate profit rate reduces the home autarkic interest rate.

What happens if the economies permit cross border capital flows? Home and foreign interest rates will be equalized at a global level \( r^G \):

\[ r = r^* = r^G. \quad (10) \]

Individual capital market clearing conditions will be replaced by a global capital market clearing condition:

\[ A + A^* = K + K^*. \quad (11) \]

Plugging in the demand for capital (3) and assets (8) at home and abroad, it can be shown that the global interest rate is a function of the global profit rate \( \pi^G \):

\[ r^G = \frac{\alpha(1-\pi^G)}{\zeta_c(\mu(1-\alpha)(1-\pi^G) + \pi^G) + \zeta_w(1-\mu)(1-\alpha)(1-\pi^G)}, \quad (12) \]

where \( \pi^G = \eta \pi + (1-\eta)\pi^* \) is a weighted average of the home and foreign profit rates in the equilibrium with capital flows and weights correspond to the relative shares of home and foreign in global GDP.

Now that capital can flow across borders, home asset demand need not be satisfied by domestic assets only. Countries can both lend and borrow, taking up positive and negative net foreign asset positions. Using equations (9) and (12) one can show that home net foreign assets as a share of GDP will be a function of the aggregate profit rate differential at home and abroad:

\[ \frac{B}{Y} = \frac{A - K}{Y} = \zeta_w(1-\eta) \frac{\pi - \pi^*}{1-\pi^G}. \quad (13) \]

Thus, inasmuch as profits distort asset supply and affect asset demand differentially in the two
economies, they will result in pre-liberalization interest rate differentials which, upon liberalization, clear by the capital flowing to an economy with higher autarkic interest rate, or, as per Proposition 1, the one with lower aggregate profit rate. If $\pi > \pi^*$ – home will maintain positive net foreign asset position in equilibrium: $B > 0$.

**Proposition 2:** If capital flows are permitted, higher aggregate profit rate relative to foreign results in home holding positive net foreign asset position in equilibrium.

### 3.4 Competitiveness in international trade

Atkeson and Burstein (2008) model lends itself naturally to study competitiveness in international trade. In the model, a firm is competitive if it has lower unit production costs $c_n$ than its competitors. This means that the firm is able to offer a price somewhat lower than the competitors, attracting a larger share of the market $s_n$. Finally, being a more competitive firm also translates into charging a higher markup and commanding a higher profit rate $\pi_n$.

These results can be generalized to conceptualize country-level competitiveness. However, care needs to be taken, as general equilibrium forces begin to apply when studying country-level phenomena.

First, consider the following definition of country-level competitiveness: an economy is competitive in international trade if its firms are competitive. To operationalize this definition, I turn to a number of aggregate measures, and show how they link to firm-level competitiveness. Note that competitiveness is always defined in contrast to a competitor. At an aggregate level, a country’s competitiveness is measured against its trading partner economies. Thus, all the aggregate measures that follow indicate competitiveness when contrasted with foreign.

First, consider the aggregate profit rate in the economy, defined in equation (4). The aggregate profit rate is simply a weighted average of the firm-level profit rates:

$$\pi = \sum_{n \in N} d_n \pi_n = \frac{1}{\sigma} + \frac{\sigma - 1}{\sigma} \sum_{n \in N} d_n s_n = \frac{1}{\sigma} + \frac{\sigma - 1}{\sigma} \bar{s}, \quad \text{where} \quad d_n = \frac{s_n}{\sum_{n \in N} s_n}, \sum_{n \in N} d_n = 1, \quad (14)$$

and where the first substitution makes use of the linear relationship (2) between profit rates and market shares when firms compete à la Cournot. The weights $d_n$ are the Domar shares of firms, defined as the firm sales as a share of all domestic sales. An economy is competitive relative to its trading partners; that is, its firms compete more successfully, if its firms command, on average, larger shares of the common market than the competitor economy ($\bar{s} > \bar{s}'$), or, equivalently, if the economy generates a higher aggregate profit rate ($\pi > \pi'$).

An alternative presentation of the same relationship gives further insights into the signs of
competitiveness. Using the market clearing condition $Y = \sum_N s_n(Y + Y^*)$, we can rewrite

$$\pi = \frac{1}{\sigma} + \frac{\sigma - 1}{\sigma} \sum_{n \in N} \frac{s_n^2}{\eta}, \quad \text{where} \quad \sum_N s_n = \frac{Y}{Y + Y^*} = \eta. \quad (15)$$

An economy is competitive if the shares of the common market its firms command are large, relative to the economy size $\eta$. In other words, a competitive economy is characterised by producing disproportionally many ‘market leaders’.

Finally, consider the aggregate unit labor costs – a metric often used to measure country-level competitiveness. Define $ULC$ as the ratio of wages to the output per worker: $ULC = w/(Y/L)$. Immediately from equation (6),

$$ULC = (1 - \alpha)(1 - \pi).$$

Thus, unit labor costs are linear in the aggregate profit rate and therefore constitute an equivalent measure of country-level competitiveness when compared to $ULC^\ast$.

**Proposition 3:** An economy is more competitive than its trading partner if its profit rate is higher, its unit labor costs are lower, or its firms command disproportionally large shares of the common market.

### 3.5 Empirical Evidence

I now return to the data to see how firms market shares, profitability and tradable sector concentration relate to capital flows. First, I check whether the structure of competition in Europe’s common market is consistent with the stylized model. To do so, I check whether firms with a higher sales share command larger profits.

I measure firm profits in two ways. First, I construct firm accounting profit rate by dividing the ‘Profit (Loss) for Period’ variable by the ‘Operating Revenue / Turnover’ and multiplying through by 100. Thus, profit rates are measured in percentage points. Second, I use balance sheet information to estimate firm-level markups following the methodology of De Loecker and Warzynski (2012). These can then be converted into model-implied profit rates (measured, again, in percentage points) using equation (2). Both variables are trimmed at $-100\%$ and $300\%$. Both methods suffer from shortcomings. There are important differences between accounting and economic profits, having to do with how the costs of capital are evaluated. The costs of capital used in computing accounting profits is the interest payment on debt, rather than the costs of installed capital. If some of the capital is owned, accounting profits overestimate economic profits. Regarding the second measure, Bond et al. (2020) show that the correct measurement of markups requires data on firm-specific price indices, which still remains largely unavailable. However, the two constructed measures are correlated ($\rho = 0.25$), suggesting that both are informative of the firm-level profitability.
I restrict my attention to 100 largest firms in each country and each 4-digit industry, focusing on tradable industries only (ISIC 0000-3400). Table 2 shows that the both measures of profitability (accounting profit-based $\pi_A$ and a measure derived using De Loecker and Warzynski (2012) markups estimates $\pi_M$) are correlated with firm’s sales shares. A one percentage point higher sales share is associated in a 0.12 percentage point higher accounting profit rate and 0.19 percentage point higher markup-based profit rate. The results survive the addition of sector, country and year fixed effects. Thus, more successful firms in terms of the share of the market they are serving are rewarded with higher profit rates.

Table 2: Relationship between Firm Profit Rates and Sales Shares

<table>
<thead>
<tr>
<th>Profit rate</th>
<th>$\pi_A$</th>
<th>$\pi_A$</th>
<th>$\pi_M$</th>
<th>$\pi_M$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales Share</td>
<td>0.119**</td>
<td>0.108**</td>
<td>0.193**</td>
<td>0.215***</td>
</tr>
<tr>
<td></td>
<td>(0.039)</td>
<td>(0.040)</td>
<td>(0.023)</td>
<td>(0.022)</td>
</tr>
<tr>
<td>Country fixed effects</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sector fixed effects</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year fixed effects</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>10266</td>
<td>10266</td>
<td>5174</td>
<td>5174</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.0008</td>
<td>0.0253</td>
<td>0.0019</td>
<td>0.2726</td>
</tr>
</tbody>
</table>

Note: Dependent variables are firm-level profit rates: $\pi_A$ stands for accounting profit computed as firm’s reported Profit/Loss divided by firm’s sales, while as $\pi_M$ is a profit rate constructed using firm-level markups, obtained using methodology of De Loecker and Warzynski (2012). Both are measured in percentage points. Fixed effects are at a country, 4-digit sector and year level. The sample covers Belgium, Germany, Finland, France, Italy, Portugal, Spain and Sweden over years 2002 - 2008 (not all years for all countries are available). Firm-clustered standard errors in parentheses. *, **, *** denote significance at the 10, 5 and 1% levels, respectively.

Consider next the sector-level predictions of the model. First, note that equation (15) can be rewritten in terms of home’s Herfindahl–Hirschman Index:

$$\pi = \frac{1}{\sigma} + \frac{\sigma - 1}{\sigma} \eta \sum_{n \in N} d^2_{in} = \frac{1}{\sigma} + \frac{\sigma - 1}{\sigma} \eta \times HHI.$$  \hspace{1cm} (16)

This is useful as the concentration measures are more readily available than shares in the common market. Second, despite the stylized model featuring one sector only, the model readily extends to feature multiple sectors (as is done in Section 4). In a multi-sector setting, it is the sectoral profit rate that is a function of sectoral concentration and country’s share of the common market sales:

$$\pi_{ik} = \frac{1}{\sigma} + \frac{\sigma - 1}{\sigma} \sum_j \frac{X_{ijk}}{Y_{ik}} \frac{X_{jik}}{X_{ik}} \sum_n d^2_{ikn} = \frac{1}{\sigma} + \frac{\sigma - 1}{\sigma} HHI_{ik} \sum_j \Psi_{ijk} \Lambda_{jik},$$  \hspace{1cm} (17)

where $\Lambda_{jik} = X_{jik}/X_{ik}$ is the trade share of imports from $i$ in $j$’s consumption of $k$, while as $\Psi_{ijk} = X_{jik}/Y_{ik}$ is the share of exports to $j$ in $i$’s sector $k$ sales. To test the predictions of the model captured in equation (16), I regress sector-level profit rate on its HHI. To control for the $\sum_j \Psi_{ijk} \Lambda_{jik}$ term I add sector, country and year fixed effects. The results can be seen in
Table 3: more concentrated sectors show higher aggregate accounting profit rates. The result for markup-based profit rates is similar in magnitude but is insignificant.

Table 3: Relationship between Sector Profit Rates and Concentration

<table>
<thead>
<tr>
<th>Profit rate</th>
<th>$\pi_A$</th>
<th>$\pi_M$</th>
</tr>
</thead>
<tbody>
<tr>
<td>HHI</td>
<td>0.048**</td>
<td>0.044</td>
</tr>
<tr>
<td></td>
<td>(0.024)</td>
<td>(0.07)</td>
</tr>
</tbody>
</table>

Note: Dependent variables are sector-level profit rates aggregates using firm revenues as weights. $\pi_A$ uses accounting profit computed as firm’s reported Profit/Loss divided by firm’s sales, while as $\pi_M$ uses a profit rate constructed using firm-level markups, obtained using methodology of De Loecker and Warzynski (2012). Both are measured in percentage points. HHI (Herfindahl–Hirschman Index) is computed as a sum of squared firm sales shares, measured at by country, sector and year. Fixed effects are at a country, sector and year level. The sample covers Belgium, Germany, Finland, France, Italy, Portugal, Spain and Sweden over years 2002 - 2008 (not all years for all countries are available). Country-and sector-clustered standard errors in parentheses. *, **, *** denote significance at the 10, 5 and 1% levels, respectively.

4 Quantitative Model

In this section I extend the stylized model to map more readily to the data and discuss how it is calibrated.

4.1 From Stylized to Quantitative Model

Fully fledged model differs from the stylized model in three ways. First, I allow for $n \geq 2$ countries and $K \geq 1$ sectors. Introducing multiple countries is straightforward: the only difference with the stylized model is that the summation in equations (1) and (7) is now over all trading partners, not just home and foreign. Multiple sectors, in turn, enter through a higher level aggregation in the final goods production function, which now becomes Cobb-Douglas in the sectoral goods with weights $\gamma_{ik}$, nested with CES at a variety level:

$$Q_i = \prod_K Q_{ik}^{\gamma_{ik}}, \quad \text{where} \quad Q_k = \left[ \sum_{n \in M} q_{kn}^{\frac{\sigma-1}{\sigma}} + \sum_{n^* \in M^*} q_{kn^*}^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}, \quad \sum_K \gamma_{ik} = 1.$$

Second, I allow for costly trade. This extension is important as trade costs protect domestic firms from competition, and thus have a first order effect on aggregate profits. While costless trade yields one common market for each sector, costly trade means that there are as many (sector-level) markets as there are economies. Firms may choose whether to export, and what
markup to charge on their exports, independently of their domestic sales considerations. Thus, firm sales shares and profit rates are now determined for each of the markets the firm serves, with \( j \) index marking the market: \( s_{jikn}, \pi_{jikn} \). I introduce trade costs as iceberg costs, applying as a percentage over the marginal costs. Thus, costs of production (for a firm with \( a = 1 \) are now market specific:

\[
c_{jik} = \begin{cases} 
\left( \frac{w_1}{1-\alpha} \right)^{1-\alpha} \left( \frac{r_1}{\alpha} \right)^{\alpha} & \text{if sold domestically} \\
\left( \frac{w_1}{1-\alpha} \right)^{1-\alpha} \left( \frac{r_1}{\alpha} \right)^{\alpha} \tau_{jik} & \text{if sold in } j, \ \tau_{jik} \geq 1.
\end{cases}
\]

Third, I now introduce a fully-fledged asset demand for the two types of households. I borrow the setup from Straub (2018), stripping away the individual income- and date-of-death uncertainty to aid computation. Households are born and live for \( T \) periods in an overlapping generations manner. The birth rate is \( 1/T \), so the size of the population remains constant. The two groups of population, workers and capitalists, represent dynasties with no mobility between the types: workers give birth to workers and capitalists to capitalists. Within each dynasty, three generations co-exist: each agent is born (and immediately enters the labor force) at the age of \( t_0 = 0 \). At age \( t_1 = T/3 \) an agent gives birth to one child. At age \( t_3 \) the agent leaves workforce and is retired until the age of death \( T \). The only difference in the life progression between the workers and capitalists is that capitalists, as the owners of the firms in the economy, pass on the ownership (and therefore the claim to profits) to their child at the age of \( t_2 = 2T/3 \) (when the child is aged \( t_1 \)). Thus, the non-financial income of the two types of households is as follows:

\[
y^w_s = \begin{cases} 
w & \text{if } 0 < s \leq t_3 \\
0 & \text{if } s > t_3
\end{cases}
\]

\[
y^c_s = \begin{cases} 
w & \text{if } 0 < s \leq t_1 \\
w + \frac{\Pi}{\mu L} & \text{if } t_1 < s \leq t_2 \\
w & \text{if } t_2 < s \leq t_3 \\
0 & \text{if } s > t_3.
\end{cases}
\]

The budget constraint is standard:

\[c_t + a_{t+1} = y_t + (1 + r_t)a_t.\]

The agent receives the inheritance from their grandparent, so the asset holdings at the start of life are the assets held at the date of death by their grandparent, \( a_T \).

Each agent has a utility function that depends on per-period consumption and on the
bequest left at the time of death:

\[ U = \sum_{s=0}^{T} \beta^{s} u_{s}(c_{s}) + U_{a}(a_{T}). \]

Following Straub (2018), I pick

\[ u_{s}(c) = \frac{(c/o)^{1-\sigma_{s}}}{1-\sigma_{s}}, \quad \text{where} \quad \sigma_{s} > 0, \quad o > 0, \]

where \( \sigma_{s} \) is an age-dependent parameter that governs the income elasticity of consumption over the life-cycle, and

\[ U_{a}(a) = k \frac{(a + q)^{1-\sigma_{T}}}{1-\sigma_{T}}, \quad \text{where} \quad \sigma > 0, \quad k > 0, \quad a > 0. \]

This setup generates two sources of non-homoetheticity in asset holdings. First, the intercept in the bequest part of the utility function ensures that bequeathing is a luxury: richer agents will be saving more to leave a larger inheritance for their grandchild. There is extensive evidence that bequests as a share of income do indeed increase as individuals get richer (see for example Dynan, Skinner and Zeldes (1996), Lillard and Karoly (1997), Carroll (1998)). Second, I follow Straub (2018) in parameterizing \( \sigma_{s} \) to decline in age, with \( \sigma_{s+1}/\sigma_{s} = \sigma^{\text{slope}} < 1 \). This generates a higher late-life expenditure amongst the richer agents in the economy, thus encouraging them to accumulate assets for late-life consumption. Such late-life expenditures can be thought of as covering, e.g., college fees for the kids, expensive medical procedures or vacations during retirement, all of which are more prevalent among the higher-income households. The empirical evidence in support of the differing life-cycle expenditure patterns amongst different income groups can be found in Straub (2018). The rest of the model remains unchanged. The full description of the quantitative model can be found in Appendix A.

Lastly, before turning to calibration I specify a parametric distribution from which firms make their productivity draws. I assume firms draw productivities from a Pareto distribution, with CDF

\[ G_{ik}(a) = 1 - \left( \frac{a}{a_{ik}} \right)^{\theta_{ik}}, \]

where \( a_{ik} \) and \( \theta_{ik} \) are country and sector specific cutoff- and tail parameters of Pareto distribution. There is evidence that the productivities in the right tail of firm distribution are Pareto distributed (see e.g. Gabaix (1999) and Luttmer (2011)). Since I am focusing on the top largest 100 firms in each country-sector-year pair, this seems like a reasonable assumption.

The endogenous variables in the quantitative model are \( \{ s_{ijkn}, P_{jikn}, w_{i}, r_{i}, Y_{i} \} \) for each country \( i \in I \), trade partner \( j \in I \), sector \( k \in K \) and firm \( n \in N \), and a vector of consumption and asset holdings for each type of agent and each age: \( \{ c_{s,w}, c_{s,c}, a_{s,w}, a_{s,c} \} \) for \( s \in T \). I focus on the steady state for now. The parameters of the model are \( \{ \alpha, \tau_{i}, \gamma_{ik}, \sigma, \beta, \sigma^{\text{slope}}, \kappa, o, a \} \) for each country \( i \in I \), trade partner \( j \in I \) and sector \( k \in K \).
4.2 Calibration

The model with free capital flows can be solved in blocks. The first block is the goods production part of the model, where the competing firms determine the country-level income, profit rates, sectoral sales and trade flows. Since the interest rate is equalized across countries and since all firms produce with the same production function, the interest rate is irrelevant for the equilibrium in the goods market. The second block is the household asset demand. Equipped with the incomes and profit rates from the goods market block, I can solve for the demand for assets by the two agent types country by country and determine the net foreign asset positions in equilibrium. This means that the model can be calibrated in blocks too: first, I determine the firm productivity distributions and trade costs that can rationalize the trade flows and sectoral concentration observed in the data. Then, I turn to the calibration of the parameters of the household side of the model.

4.2.1 Data

I am calibrating the model to eight economies in the empirical section: Belgium, Germany, Finland, France, Italy, Portugal, Spain and Sweden. To calibrate the production side of the economy, I need data on population and on sectoral output, bilateral trade flows, consumption and concentration. The first four I obtain from World Input-Output Database (WIOD). Since the model doesn’t feature intermediate inputs, I use sectoral absorption (the sum of final and intermediate consumption) as my consumption series and value added as my sectoral sales. Finally, I am using the sectoral HHI, from Orbis, as my measure of concentration. I am using 2007 as my reference year as this is the earliest year where all countries are covered. Since WIOD sectoral classification is somewhat coarser than the 2-digit NACE rev.2 in Section 2, I aggregate the industries to match the 16 tradable sectors reported in WIOD. Together with the non-tradable aggregate, this gives me 17 sectors. To calibrate the household block of the model I rely on data from OECD.

4.2.2 Production Block

*External Calibration:* I calibrate $\alpha$, the capital share in production of varieties, and $\sigma$, the elasticity of substitution across varieties in CES production of the final good, externally. I set $\alpha$, the share of capital in production to 0.34, the average value for the eight economies in WIOD, and $\sigma$ to 10.5 following Edmond et al. (2015). Due to the Cobb-Douglas specification of the final good production technology, I use consumption series from the data to calibrate final good expenditure shares $\gamma_{ik}$ directly as a ratio of sectoral absorption to total absorption. I set $N$, the number of firms in each country and sector to a value of 100. The model is sensitive to the number of firms operating when the total number of firms competing is relatively small, but robustness simulations (see Appendix B) show that the results are not sensitive to increasing $N$ above 100. In the data, the number of firms per sector are orders of magnitude higher, but due to the fat tailed distribution of the firms in the data, restricting analysis to the largest 100
firms doesn’t affect the measured sectoral concentration. Thus, I pick $N = 100$ as a compromise between the simulations being less computationally intensive and yet still true to the data.

**Internal Calibration:** having set the external parameters, I am left with three sets of parameters in the goods block to estimate internally: $\alpha_k, \theta_{ik}, \tau_{jik}$. Firm productivity distribution parameters and trade costs jointly determine firm-level sales in each of the markets, which in turn shapes the patterns of bilateral trade flows and sectoral sales distributions. Thus, I calibrate the three to match the patterns observed in the data, targeting the sector- and country-pair trade shares $\Lambda_{jik} = X_{jik}/X_{ik}$, where $X_{jik}$ is the exports of sector $k$ goods from country $j$ to country $i$ and $X_{ik}$ is $i$’s total expenditure on sector $k$ goods, and sectoral Herfindahl–Hirschman Indices computed using Orbis firm-level data for each country and sector. I further restrict the shape parameters of the country-sector Pareto distributions to be a product of country- and sector-specific terms: $\theta_{ik} = \theta_i \theta_k$. This substantially reduces the number of parameters to estimate and prevents model over-fitting. I search over the parameter space to minimize the distance between the trade shares and HHI in data and in the model.

### 4.2.3 Household Block

The next step is to calibrate the demographics and household preferences. In parameterizing the household side, I choose a common set of parameters for all eight economies that I am modelling. I do this so that the simulated capital flows are driven by the heterogeneity on the firm side and not the household side. For this purpose, I target the average moments across the eight economies.

**External Calibration:** First, I set the age of entry to the labor force to 26 years – the age at which half the age-cohort is in full-time employment. I set the age of retirement to 63 – the average across the eight economies. I set the age of death to the average life-expectancy in the sample – 80. To simplify the transition of firm ownership I assume that the agents give birth at the age of 20. This way, four generations co-exist in each dynasty. The firm ownership passes from the parent, at their age of 60, to their child, who is 40 at the time. I set the share of capitalists, $\mu$, to be 0.1 – following Cagetti and De Nardi (2006), the discount factor to 0.97 following De Nardi (2004), and the income elasticity of consumption at the median age, $\sigma_{med}$, to 2.5 as in Straub (2018).

**Internal Calibration:** in Straub (2018), $\kappa$ an $\alpha$ are set as to target bequests as a share of GDP (5% for the US) and a 30% share of households with bequests below 6.25% of average income. For the time being, I adopt the 5% bequests to GDP ratio as a target. However, since I do not model the full distribution of incomes, I chose a different target to calibrate the parameters governing the heterogeneity of the household saving behaviour. I target the ratio of assets per capita between of the 95th and 50th percentiles of wealth distribution. I choose the two percentiles to represent the median worker household (bottom $1 - \mu = 90\%$ of the distribution) and the median capitalist household (top $\mu = 10\%$ of the distribution). This gives me a value of 7.1. The scale parameter $o$ anchors the strength of the average income elasticity of consumption. A low $o$ shifts up the asset demand of both types of households. I set $o$ as to match the aggregate assets to GDP ratio that, together with the depreciation rate of 3.7% results in a net interest rate of 3%. Finally, I
set $\sigma_{slope}$ to match the propensity to consume out of permanent income of 0.699, as estimated in Straub (2018). This exercise yields a $\sigma_{slope} = 0.99$.

Table 4: Baseline calibration

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
<th>Target/Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\alpha$</td>
<td>Capital Share</td>
<td>0.34</td>
<td>WIOD</td>
</tr>
<tr>
<td>$\delta$</td>
<td>Depreciation</td>
<td>0.037</td>
<td>PWT</td>
</tr>
<tr>
<td>$\sigma$</td>
<td>Within-sector elasticity of substitution</td>
<td>10.5</td>
<td>Edmond et al. (2015)</td>
</tr>
<tr>
<td>$\gamma_{ik}$</td>
<td>Cobb-Douglas shares in final production</td>
<td>Vector</td>
<td>Sectoral absorption, WIOD</td>
</tr>
<tr>
<td>$\tau_{jik}$</td>
<td>Bilateral trade costs</td>
<td>Matrix</td>
<td>Bilateral trade flows, WIOD</td>
</tr>
</tbody>
</table>

| Firm distribution | | | |
| $a_{ik}$ | Productivity Pareto scale parameter | Matrix | Bilateral trade flows, WIOD |
| $\theta_{ik}$ | Productivity Pareto shape parameter | Matrix | $HHI_{ik}$, Orbis |
| $N$ | Number of firms per sector | 100 | |

| Population | | | |
| $t_0$ | Age of entry into the labor force | 27 | OECD |
| $t_1$ | Age of inheriting the firm (capitalists) | 40 | - |
| $t_2$ | Age of passing on the firm (capitalists) | 60 | - |
| $t_3$ | Age of retirement | 63 | OECD |
| $T$ | Age of death | 80 | OECD |
| $\mu$ | Share of capitalists | 0.1 | Cagetti and De Nardi (2006) |

| Preferences | | | |
| $\beta$ | Discount factor | 0.97 | Cagetti and De Nardi (2006) |
| $\sigma_{med}$ | Elasticity of intertemporal substitution | 2.5 | Straub (2018) |
| $\sigma_{slope}$ | Ratio of elasticities $\sigma_{s+1}/\sigma_{s}$ | 0.99 | Match $\phi = 0.699$ |
| $k$ | Weight on bequest motive | 7.01 | Match bequests/GDP = 0.05 |
| $o$ | Scale term in utility function | 1.88% of GDP | $r = 0.03$, PWT |
| $g$ | Intercept in bequest utility | 0.0657 | Match bequests/GDP = 0.05 |

4.3 Model Fit

Targeted moments – fitting $N \times K$ scale parameters $a_{ik}$ and $N \times N \times K$ trade cost parameters $\tau_{jik}$ means that I have enough parameters to match the sector- and country-pair trade shares exactly. In addition to matching the expenditure shares one for one as Cobb-Douglas shares, this means that the simulated model matches the sectoral sales and country-level GDP exactly. In turn, restricting the shape parameters of the firm productivity distribution to be a sum of country- and sector-specific terms means that the sectoral concentration in the data can only be
matched in the least squares sense. Figure 5 presents the scatter plot of sectoral HHI in the data and in the model. The fit seems to be reasonably close. The remainder of the targeted moments pertain to the household side of the model. The values targeted and their model counterparts are shown in Table 4.

Figure 5: Herfindahl–Hirschman Index in the data and in the model

Untargeted moments – there are three categories of untargeted moments in the calibration. First, the aggregate profit levels are controlled by the elasticity of substitution across the varieties, as can be seen in equation (17). The level of aggregate profits was not targeted directly – instead, I picked the value of \( \sigma \) from the literature (note that the value selected, \( \sigma = 10.5 \), is in the top of the range typically estimated). Thus, the profits in the model are bounded from below by \( 1/\sigma = 9.5\% \). The average aggregate profit rate in the simulation is 13.4\%. This number is not straightforward to compare with the aggregate profit rate in the data, as the profit rates in the data are computed as a share of the total sales, i.e. the sum of the value added, intermediate inputs and profits. Following Basu (2019), I compute for each of the economies a back-of-the-envelope measure of profit rates as a share of the profits and value added only\(^4\):

\[
\pi^{va} = \frac{\pi}{1 - s_m},
\]

\(^4\)See Footnote 8 in Basu (2019) for the formula.
where \( s_m \) is the share of intermediate inputs in production. The average share of inputs is 0.5, so the average aggregate profits to value added in the data are 11.5%.

Finally, there is a number of moments that are not explicitly targeted on the household side of the calibration. For example, while asset side inequality is used to calibrate the strength of the non-homotheticity in utility function, the income inequality is not targeted. Nevertheless, the ratio of non-financial income of the two groups, \( y_c/y_w \) is 3.6 in the model, compared to the ratio of 95th to 50th percentile incomes of 3.3 in the data. While the model abstracts from the vast majority of sources of income inequality, it is surprisingly successful at capturing the income differences between these two groups. Thus, I conclude that, while certainly simplistic, the model is able to capture, in very broad strokes, a pattern of household income heterogeneity seen in the data.

Given that the best data coverage is for the later part of the period, I choose to calibrate the model to match the data from the year 2007, the year with the best coverage before the effects of the crisis began to be felt in Europe. I assume that by 2007 capital is freely mobile between countries, so equation (11) determines the interest rate for all eight economies\(^5\). When calibrated in this manner, the model replicates the GDP of economies exactly. However, both the aggregate profit rates and the net foreign assets \( B/Y \) are endogenously determined and were not targeted.

### 5 Simulation Results

In this section I ask the key question of the paper: what was the contribution of the competitiveness gap between the North and the South to the buildup of the current account imbalances in the pre-crisis Europe? I first outline the modelling of financial liberalization and then discuss the predictions of the model for the direction and magnitude of capital flows during the decade prior to the Global Financial Crisis.

#### 5.1 Modelling Financial Liberalization

By year 2001 the spreads between the ten-year yields on sovereign bonds of the Euro-Area countries have disappeared. Thus, I assume that by 2001 the eight economies have undergone full financial liberalization. But when did the liberalization begin? Financial liberalization in European Union involved a range of policies entering into effect between 1995 and 2001. For simplicity, I assume that the eight economies were under full financial autarky before 1998, and that in 1998, they have unexpectedly underwent complete financial liberalization. While it is not clear when the adjustment process would have been completed absent the financial crisis of 2007, the arrival of the crisis has changed the conditions in the financial markets drastically in

\(^5\)Implicitly, this assumption also implies the irrelevance of the rest of the world for the interest rate determination. Since the eight economies represent 76% of the GDP of the European Union, it seems appropriate to assume away the effects of the other member states in the determination of the interest rate. Assuming that the non-EU RoW are irrelevant is a stronger assumption to make. However, negligible current account imbalances of the European Union as a whole vis-à-vis RoW are suggestive of no asymmetry between the EU and RoW natural rates in the period.
ways that are beyond the scope of this paper. I thus stop my analysis in 2007, assuming that by 2007 the economies have reached the new steady state.

I solve for the 1998 steady state using the parameter values obtained in Section 4, but restricting cross-border capital flows. The exercise comparing the two steady states thus studies the effects of financial liberalization between heterogeneous economies, taking the firm productivity distributions, trade costs and household preference parameters as given.

I measure the average current account imbalances during the transition between the steady states as follows:

\[ \frac{\bar{CA}}{Y} = \frac{1}{T} \left( \frac{B_{i}^{lib} Y_{i}^{lib}}{Y_{i}^{lib}} - \frac{B_{i}^{aut} Y_{i}^{aut}}{Y_{i}^{aut}} \right) = \frac{1}{T} \left( \frac{B_{i}^{lib}}{Y_{i}^{lib}} - 0 \right) = \frac{1}{T} \frac{B_{i}^{lib}}{Y_{i}^{lib}}, \]

where \( lib \) marks variables from capital flow liberalization scenario, \( aut \) stands for the autarky counterfactual and \( T \) is the duration of the transition period.

5.2 Results: Current Account Imbalances between 1998 and 2007

The Table 5 below summarizes the results of the exercise. First, notice that the model is successful in matching the patterns of aggregate profit rates in the eight economies remarkably closely. Finland, Sweden and Germany show highest profit rates in the model and in the data, whereas Portugal, Spain and Italy all show the lowest aggregate profit rates. France fits right in the middle of the Northern and Southern economy profit rates in the data and in the model, and profits in Belgium are somewhat higher in the data compared to the model. Note that the profitability was not targeted during the calibration. The patterns of profitability arise endogenously and depend, primarily, on the firm productivity distribution parameters picked as to match the sectoral concentration statistics.

Second, note that the model is also successful in replicating the North-South split of the current account imbalances during the period. Sweden, Finland and Germany run current account surpluses in the model and in the data, while as Italy, Spain and Portugal are running deficits. Belgium and France run small deficits in simulation but run modest surpluses in the data. Moreover, the model generates capital flows that are of the same order of magnitude as those observed in the data. As such, the model is able to explain half of the surpluses built up by Finland and Germany, as well as a third of those of Sweden, during the pre-crisis decade. The model is less successful in replicating the magnitude of imbalances accumulated in the South. This is, however, unsurprising, as the model has abstracted from other drivers of capital flows. During the pre-crisis decade, Spain experienced a housing bubble and Portugal substantially ran up its public debt, both contributing to the current account deficits in these economies.

The model is also successful in matching the pattern of changes in the unit labor costs in the period. The surplus economies in the model have experienced increases in their ULC during the transition, while the deficit economies have seen their ULC rise. Note that sectoral productivity is kept constant across steady states. Thus, in the simulation, the changes in ULC are driven by movements in real wages alone which, in turn, reflect changes in capital per capita brought
Table 5: Simulation results: Concentration, Profits and Capital Flows

<table>
<thead>
<tr>
<th></th>
<th>Profit Rate</th>
<th>CA/Y</th>
<th>Δ ULC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model</td>
<td>Data</td>
<td>Model</td>
</tr>
<tr>
<td>Finland</td>
<td>16.4</td>
<td>18.0</td>
<td>2.5</td>
</tr>
<tr>
<td>Sweden</td>
<td>15.7</td>
<td>13.6</td>
<td>2.0</td>
</tr>
<tr>
<td>Germany</td>
<td>14.4</td>
<td>12.4</td>
<td>1.0</td>
</tr>
<tr>
<td>France</td>
<td>12.6</td>
<td>10.8</td>
<td>-0.3</td>
</tr>
<tr>
<td>Belgium</td>
<td>12.5</td>
<td>14.6</td>
<td>-0.4</td>
</tr>
<tr>
<td>Portugal</td>
<td>12.3</td>
<td>7.1</td>
<td>-0.5</td>
</tr>
<tr>
<td>Spain</td>
<td>11.6</td>
<td>8.5</td>
<td>-0.9</td>
</tr>
<tr>
<td>Italy</td>
<td>11.6</td>
<td>6.4</td>
<td>-0.9</td>
</tr>
</tbody>
</table>

Note: All variables in percent.

The relationship between capital flows and competitiveness is a nuanced one, so it is worth spelling it out in detail. In the pre-liberalization steady state, ULC are indeed higher in less competitive economies. However, higher ULC are not causing capital flows. Both high unit labor costs and deficits during the financial liberalization are an outcome of market power differentials across states. A more competitive, more profitable economy has its wages suppressed by the markup wedge. This produces lower measured unit labor costs. Notably, the price offered by a higher markup economies is no lower than that of the lower markup, less competitive states, the difference being made up by the markup precisely. In turn, high profit rates suppress the autarkic interest rate through a simultaneous reduction in capital needs of production and higher aggregate savings, leading to surpluses upon financial liberalization. Thus, initially low ULC and surpluses are an outcome of market power, but neither causes the other. During the transition to the new steady state, as capital leaves the more profitable economy, its capital to labor ratio decreases, pushing down the wages and with them, the unit labor costs. In this process, capital outflows cause a further reduction in ULC. Falling ULC are an outcome of deficits, not their driver.

It is remarkable that the model is able to generate about a quarter of the changes in unit labor costs in the tradable sector experienced by Sweden, Finland, Germany, Italy and Spain. Note that sectoral productivity is kept unchanged in the simulation. Gopinath et al. (2017), Benigno and Fornaro (2014) and Reis (2013) have argued that capital inflows into the Southern economies were misallocated, leading to declines in TFP. Thus, permitting misallocation would have led to even greater increases in ULC in the South.

5.3 What drives the current account imbalances?

In the model, current account imbalances arise along the transition path from autarky to financial openness due to the different market power that economies yield in international markets. But
what is behind these market power asymmetries? To study the relative importance of various drivers of firm competitiveness I conduct a series of experiments. The first experiment strips away any difference between economies by setting all country-specific parameters to the same common value. I then re-introduce heterogeneity, one parameter at a time, and re-compute the average current account imbalances as a share of GDP along the transition path. I repeat the exercise for five sources of country heterogeneity in the model: firm distribution location parameters \( \bar{a} \), firm distribution shape parameter \( \theta \), trade costs \( \tau \), final consumption expenditure shares \( \gamma \) and the population size \( L \). I choose sample average for the common value of each of the parameters. Equipped with country level current account imbalances from each of the experiments I compute their variance and conduct the variance decomposition exercise by dividing through by the variance of the current account imbalances in the fully calibrated model.

The results of the exercise are presented in Table 6. Note that the columns do not add up to one, due to the interaction between different kinds of heterogeneity in the model. Nevertheless, it is striking that the only type of variation that is able to measure up to the magnitude of capital flows that the full model generates is heterogeneity in the tail parameters of the firm productivity distributions, \( \theta \). Why so?

Table 6: Variance Decomposition of Current Account Imbalances

<table>
<thead>
<tr>
<th>Variable</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>( L )</td>
</tr>
<tr>
<td>Productivity location</td>
<td>( \bar{a} )</td>
</tr>
<tr>
<td>Expenditure shares</td>
<td>( \gamma )</td>
</tr>
<tr>
<td>Trade costs</td>
<td>( \tau )</td>
</tr>
<tr>
<td>Productivity shape</td>
<td>( \theta )</td>
</tr>
</tbody>
</table>

Note: The columns do not add up to one due to the interaction between different kinds of heterogeneity in the model.

In the model, capital flows from the high markup to low markup economies. But what is the source of the market power of the high markup economies? Low costs of export \( \tau \) or high average TFP confer a cost advantage to all firms in an economy. But this cost advantage is eroded by a wage increase associated with higher demand for domestically produced goods. The two effects cancel out so that the market power of domestic firms on international markets remains intact. A fatter tail of firm productivity draws at home (low \( \theta \), on the other hand, ensures that, amongst the firm productivity draws, a few will wind up being very large, leading to the formation of superstar firms. The presence of low productivity competitors prevents the wages from rising sufficiently to erode the cost advantage of the extreme draws. Thus, the few lucky ones hold disproportional market power. It is the co-existence of very productive and mediocre firms that renders an economy internationally competitive.
5.4 On the location of ‘superstar’ firms

In the model, the heterogeneity in the tail parameter of the firm productivity distributions across countries is treated as a fundamental property of economies. Thus, some economies naturally produce more market leaders than the others. However, the model developed in Section 4 is isomorphic to a model where the firm productivity distributions are the same across countries. Instead, firms are subject to firm-specific distortions which are related to firm size.

Following Bento and Restuccia (2017), suppose that a firm \( n \), after production is completed, is left with \((1 - \tau_n)\) of its produce. Moreover, the size of the firm-specific distortion \( \tau_n \) is linked systematically to the firm productivity:

\[
(1 - \tau_n) = a_n^{\gamma}. 
\]

Bento and Restuccia (2017) refer to \( \gamma \) as the elasticity of a firm’s distortion with respect to its productivity. \( \gamma > 0 \) means that productive firms are penalized disproportionately. It is easy to show that the model presented in Section 4 is isomorphic to a model where firms draw productivities from a Pareto distribution with common shape parameter \( \theta \) and with size-related distortions with elasticity

\[
\gamma_i = 1 - \frac{1}{\theta_i}. 
\]

Thus, in a model with homogeneous firm distributions but country-specific distortion elasticities, setting \( \gamma_i = 1 - 1/\theta_i \) would minimize the distance between the data and the model. To identify elasticities I assume that German firms are undistorted. This pins down values of \( \gamma_i \) for other economies. The resulting values of \( \gamma_i \) are presented in Table 7. Unsurprisingly, the exercise indicates that the compressed size distribution of Southern firms is due to distortions that are highly correlated with firm productivity.

<table>
<thead>
<tr>
<th></th>
<th>Belgium</th>
<th>Germany</th>
<th>Spain</th>
<th>Finland</th>
<th>France</th>
<th>Italy</th>
<th>Portugal</th>
<th>Sweden</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \gamma )</td>
<td>0.2</td>
<td>0</td>
<td>0.36</td>
<td>-0.17</td>
<td>0.21</td>
<td>0.37</td>
<td>0.23</td>
<td>-0.14</td>
</tr>
</tbody>
</table>

5.5 Discussion: Rebalancing Europe

What are the implications of the model for the rebalancing of Europe? Over the last two decades, there were countless recommendations to boost competitiveness as a way of unwinding current account and net foreign asset imbalances. Under competitiveness, commentators typically understand unit labor costs. This paper shows that high ULC is not the driver of current account deficits, but their correlate (before liberalization) and their outcome (after liberalization). Recommendations to reduce ULC, in their most benign form, call for a push to increase aggregate productivity; in their least benign form they invite a decrease in wages. As the exercise in Section 5.3 indicates, neither of the two is likely to lead to rebalancing.
Instead, this paper locates the root of imbalances in the higher competitiveness of individual firms in the North, manifesting in their higher prevalence in international markets and in higher market power held, when compared to their Southern counterparts. Inasmuch as removing distortions that prevent the development of market leaders in Southern economies is feasible, such policies would lead to rebalancing. Inasmuch as this is a fundamental property of these economies, accepting imbalances as naturally occurring between the asymmetric European economies and ensuring that they do not lead to fragilities exposed by the crisis of 2008 should be a priority.

6 Conclusion

In this paper I have argued that capital flows from the European North to South, in years 1998-2007, have been in part driven by the differential competitiveness of the Northern and Southern firms in the common European market. Better ability to compete on the part of Northern firms translated into larger profits, which in turn generate income without an associated increase in asset supply, and are themselves in a need of an investment opportunity. The two effects cause capital outflows from the North and into the South.

I present my argument in three steps. First, I present three stylized facts: (i) North and South have experienced diverging current account imbalances; (ii) North and South have shown a gap in trade competitiveness as measured by the relative prevalence among the market leaders, profits in the tradable sector and unit labour costs; (iii) current account imbalances correlated, over the period, with the measures of trade competitiveness. I then construct a stylized two-country model featuring oligopolistic trade and heterogeneous households. The capital flow dynamic during a period of financial liberalization in this model depends on the aggregate profit rate in the two economies. I then further investigate the effects of trade in imperfectly competitive markets on capital flows in pre-GFC Europe by constructing a fully calibrated quantitative model. In the model, I show that capital flow liberalization between eight European economies leads to current account surpluses in the North of around 2% of GDP, and deficits in the periphery of around 1% of GDP. Moreover, the differential competitiveness is driven not by higher average productivity in the North, but by the presence of extremely productive ‘superstar’ firms.

There is renewed recognition that ‘fickle’ capital flows can be damaging to recipient economies (Caballero and Simsek (2020)). In the world increasingly characterized by superstar firm dynamics (Autor et al. (2020)), some economies may find themselves locked in in a double-trap of lacking the scale to compete effectively on international markets, and on the receiving end of fickle capital flows that expose them to excess volatility. A better understanding of how the export competitiveness and capital flows relate to each other is important for the economic and political future of Europe.
References


A Quantitative Trade Model

Quantitative model features $I$ economies indexed by $i$ when a producer and $j$ when a consumer, $K$ sectors in each indexed by $k$, and $N$ firms in each sector. Production functions are as before:

$$q_{ikn} = a_{ikn}k_{ikn}^{\alpha}l_{ikn}^{1-\alpha},$$

The intermediate goods are combined into a final good by a final good producer, using a nested-CES technology with an elasticity of substitution $\sigma > 1$:

$$Q_i = \prod_K Q_{ik}^{\beta_{ik}}, \text{ where } Q_k = \left[ \sum_{i \in I} \sum_{n \in M_i} q_{ikn}^{\frac{\sigma-1}{\sigma}} \right]^\frac{1}{\sigma}, \sum_K \gamma_{ik} = 1.$$

Firm prices and sales shares are now:

$$P_{jikn} = \frac{\sigma - 1}{\sigma} \frac{c_{jikn}}{1 - s_{jikn}},$$

where

$$c_{jikn} = \begin{cases} \left( \frac{w_i}{1-\alpha} \right)^{1-\alpha} \left( \frac{r_i}{\alpha} \right)^{\alpha} \frac{1}{a_{kn}} & \text{if sold domestically} \\ \left( \frac{w_i}{1-\alpha} \right)^{1-\alpha} \left( \frac{r_i}{\alpha} \right)^{\alpha} \frac{1}{a_{kn}} \tau_{jik} & \text{if sold in } j. \end{cases}$$

Note that now firms can charge different prices in different markets where they sell. Moreover, firm sales shares are now defined as a share of sales in a given market $j,k$. Firm sales shares are a function of the price they charge vis-à-vis that of the competitors:

$$s_{jikn} = \frac{P_{jikn}^{1-\sigma}}{\sum_i \sum_{n \in M_i} P_{jikn}^{1-\sigma}}.$$

Firm profit rate is as before:

$$\pi_{jikn} = \frac{\Pi_{jikn}}{P_{jikn}q_{jikn}} = \frac{P_{jikn}q_{jikn} - c_{jikn}q_{jikn}}{P_{jikn}q_{jikn}} = 1 - \frac{c_{jikn}}{P_{jikn}} = \frac{1}{\sigma} + \frac{\sigma - 1}{\sigma} s_{jikn}.$$

As before, there are no entry or operation fixed costs, so all $N$ firms operate in equilibrium: $M_i = N \forall i$. Firm level factor demands,

$$r_{ikn} = \sum_{j \in I} \alpha c_{jikn}q_{jikn} = \sum_{j \in I} \alpha (1 - \pi_{jikn}) P_{jikn}q_{jikn},$$

$$w_{ikn} = \sum_{j \in I} (1 - \alpha)c_{jikn}q_{jikn} = (1 - \alpha) \sum_{j \in I} (1 - \pi_{jikn}) P_{jikn}q_{jikn},$$
result in aggregate factor demand:

\[ rK = \sum_{j \in I} \sum_{K,N} \alpha(1 - \pi_{jkn})P_{jkn}q_{jkn} = \alpha Y(1 - \pi), \]

\[ wL = \sum_{j \in I} \sum_{K,N} (1 - \alpha)(1 - \pi_{jkn})P_{jkn}q_{jkn} = (1 - \alpha)Y(1 - \pi), \]

where \( \pi = \frac{\sum_{j \in I} \sum_{K,N} \Pi_{jkn}}{\sum_{j \in I} \sum_{K,N} P_{jkn}q_{jkn}}. \)

Like before, sectoral and aggregate profit rates can be linked to country-level Herfindahl–Hirschman Indices. Consider first sectoral profit rates:

\[ \pi_{ik} = \frac{1}{Y_{ik}} \sum_{j} \sum_{n} P_{jkn}q_{jkn} \pi_{jkn} = \frac{1}{Y_{ik}} \sum_{j} \sum_{n} P_{jkn}q_{jkn} \left( \frac{1}{\sigma} + \frac{\sigma - 1}{\sigma} s_{jkn} \right) = \frac{1}{\sigma} + \frac{1}{Y_{ik}} \frac{\sigma - 1}{\sigma} \sum_{j} \sum_{n} P_{jkn}q_{jkn} \psi_{jkn}, \]

where \( s_{jkn} = \frac{P_{jkn}q_{jkn}}{X_{jk}} \) and \( X_{jk} = \sum_{i} \sum_{n} P_{jkn}q_{jkn} \) is \( j \)'s sectoral consumption of \( k \) and \( \psi_{jkn} = \sum_{i} P_{jkn}q_{jkn} \) are sector \( k \) sales of firms from \( i \). The data on sales by origin and destination, \( P_{jkn}q_{jkn} \) is unavailable. Thus, I make an assumption to proceed.

Assumption 1: firm-level exports constitute the same proportion for each destination market across firms, i.e.

\[ P_{jkn}q_{jkn} = \frac{X_{jik}}{Y_{ik}} y_{ikn}, \]

where \( X_{jik} \) are imports of \( k \) to \( j \) from \( i \) and \( y_{ikn} = \sum_{j} P_{jkn}q_{jkn} \) are firm \( n \) sales. \( X_{ik} \) stands for home’s consumption of domestically produced goods in sector \( k \).

Then,

\[ \pi_{ik} = \frac{1}{\sigma} + \frac{1}{Y_{ik}} \frac{\sigma - 1}{\sigma} \sum_{j} \sum_{n} \frac{X_{jik}}{X_{jk}} \frac{d_{jkn}}{d_{jkn}}, \]

where \( d_{jkn} = \frac{y_{ikn}}{\sum_{n} y_{ikn}} \), is the Domar weight of firm \( n \) in \( i \)'s sales of \( k \). Rearranging,

\[ \pi_{ik} = \frac{1}{\sigma} + \frac{1}{\sigma} \sum_{j} X_{jik} \frac{\psi_{jik} \Lambda_{jik}}{Y_{ik}} HHI_{ik}, \]

where \( \Lambda_{jik} = \frac{X_{jik}}{X_{jk}} \) is the trade share of imports from \( i \) in \( j \)'s consumption of \( k \), while as

\[ \psi_{jik} = \frac{X_{jik}}{Y_{ik}} \] is the share of exports to \( j \) in \( i \)'s sector \( k \) sales.

Finally, aggregating at a country level,

\[ \pi_{i} = \frac{\sum_{k} \Pi_{ik}}{Y_{i}} = \frac{\sum_{k} Y_{ik} \pi_{ik}}{Y_{i}} = \frac{1}{\sigma} + \frac{1}{\sigma} \sum_{k} \gamma_{ik} \sum_{j} \psi_{jik} \Lambda_{jik} HHI_{ik}, \]

where \( \gamma_{ik} = \frac{\sum_{k} Y_{ik}}{Y_{i}} \) is the share of \( k \) in \( i \)'s output.