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European Monetary Integration and Average Industry Productivity

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Abstract

Following the financial crises, the macroeconomic effects of EMU have been extensively discussed however research investigating the micro adjustments of entrant countries' industries is still lacking. This thesis studies the effects of trade liberalisation, namely the European monetary integration has on the industry average productivity. The underlying theoretical model of Melitz (2003) develops a dynamic industry model with heterogeneous firms explaining the impact of trade on intra-industry resource and profit reallocations. The analysis is extended to incorporate Heckshcher-Ohlin model predictions, and hypotheses are drawn from the complementing model conclusions. The empirical model using comprehensive firm level data of 29 Eastern European and Central Asian countries for the time period 2003-2013 validates the models' hypotheses. Specifically, strong evidence is found to show that trade liberalisation leads to industry average productivity gains. Some evidence is also found for EMU having the same effect, however the results are not robust across specifications. Finally, the results also show some indication of model complementarity as comparative advantage sectors are found to gain proportionately more from trade liberalisation.

Key Words: Trade liberalisation, EMU, Average Productivity Parameter, Industry Average Profits, Comparative Advantage, Melitz (2003)

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Contents

1. Introduction

In May 2004, European Union had the largest expansion since its inception when it accepted 10 new countries, predominantly from the CEE region adding an extra 100 million citizens under its institution.[1] This was consequently followed by all countries entering the Exchange Rate Mechanism where all the national central banks pegged their currencies to the Euro within a strict 15% margin. The accession promised new member states macroeconomic stability and most importantly the desired convergence with the west. Countries from the CEE region have undergone a rapid transition from socialist economies to become free market economies. Their trade liberalisation process began early on, with for example the signing of the CEFTA free trade agreement between Czechoslovakia, Poland and Hungary in 1992 and BAFTA established between Estonia, Lithuania and Latvia in 1994. Since then, the countries in question have all entered the EU and joining the EMU constitutes the last step in their pursuit for European free trade and convergence. The most recent EMU entrants from Eastern Europe includes Slovenia (2007), Slovakia (2009), Estonia (2011), Latvia (2014) and Lithuania (2015).[2]

Following the global economic and financial crises, European economies have struggled to bounce back, dealing with low growth levels, fiscal prudence and lack of competitiveness. Moreover recent events with regards to the sovereign debt crises in Greece have shone light on the major pitfalls of the European Monetary Union. Since the financial crises of 2008, Greece encountered economic difficulties partly attributed by their lack of competitiveness on the international markets.[3] Having a relatively strong euro currency shared with its north European counterparts has meant that Greece has been unable to externally devalue its currency in order to regain that competitiveness. Multiple bailouts under strict conditions have not sufficiently worked to boost its economy. Despite the fact that, these conditions meant Greece had to internally devalue through cutting of real wages, the results were not as effective as initially hoped. Recent developments have seen their third financial bailout come under scrutiny, as it once again involved conditions often argued to be counterproductive towards Greek prosperity. There was ever more support for the rhetoric that leaving the currency union and returning to the Drachma would benefit domestic firms through a large scale external currency devaluation, thereby Greek goods becoming relatively cheaper to the foreign buyers.[4] The Eurozone's inability to deal with such external shocks raises a very interesting question, whether joining the EMU was in fact beneficial for the recent entrants from the eastern European region. The answer to the question is also of concern for the remaining countries within the EU who are yet to adopt the Euro, as now the stakes may be too high for them to proceed with such policy. Despite the economic struggles, Walter (2009) the chief economist at the Deutsch Bank points out that the desire to join the EMU amongst the remaining EU countries like Czech Republic and Poland is still strong, mainly due to the financial shelter the Eurozone provides. However he emphasises that any country specific structural problems are not going to be solved by Euro adoption and hints that prior to the further expansion of the EMU, candidate countries ought to stabilise their economies in

[1] CEE is an acronym for Central and Eastern European
EU expansion source: http://europa.eu/.
Since 2004, the EU expanded further with Romania and Bulgaria entering in 2007 and Croatia in 2013

[2] EU and EMU refer to European Union and European Monetary Union respectively. CEFTA and BAFTA refer to the Central European Free Trade Agreement and Baltic Free Trade Agreement respectively.

[3] OECD Economic Surveys Greece (November, 2013)

[4] http://www.reuters.com/article/eurozone-greece-drachma-

line with and beyond the Maastricht treaty requirements which is not an exception for EMU insiders, as some of them now fail to comply with the treaty's fiscal responsibility as well. In light of the economic developments, we have seen an increase in the popularity of Eurosceptic political parties which has subsequently also shifted the public consensus in opposition to the European institutions.[5] Moreover the Slovak national agency for development of small and medium sized enterprises (NADSME, 2008), surveyed over a 1000 firms with employees of 0 to 249 with an aim to study their perception of the country's upcoming Euro adoption. The results found showed that 48.7% of firms in the sample claimed that they anticipated that the adoption of the euro will have no significant effect on their business. 33.1% of firms anticipated a negative impact and only 18 % expected more benefits than costs from adoption of the euro.

Generally, the arguments in favour and against the Euro tend to focus on the macroeconomic effects and often tend to neglect assessing the micro-level adjustments we can expect from joining the Eurozone. This is especially emphasised in the paper by Baldwin (2006) who assess previous academic studies that aimed to aggregate Euro's trade effects. In particular the paper argues that the question of "how much did the euro boost trade?" is the wrong one to ask and academics should rather divert their focus to and tackle the question "If the euro boosted trade by sharpening competition, then in what dataset should we find the footprints?" and this is exactly what this thesis is going to do. More specifically, it focuses on the firm-level adjustments to study the potential costs and benefits of the Euro, with the hypothesised effects being motivated by Melitz (2003) theoretical model. The theoretical model of Melitz (2003) explains a dynamic industry model with heterogeneous firms in order to analyse intra-industry effects of international trade. More specifically the model shows that opening up to trade will induce only the most productive pool of firms to enter the export market. In addition it shows that, increased competition from abroad leads to the least productive firms exiting the market. This is consequently followed by intra-industry resource reallocations from the least to the most productive firms which in effect produces aggregate welfare gain. The theoretical findings not only show that trade liberalisation will lead to a higher average productivity parameter but also to higher average profits. Within the empirical literature, entering the EMU is argued to be representative of a trade liberalising process due to its positive effect on intra-European trade (Belke and Spies, 2008; Bun and Klaassen, 2002; Flam and Nordström, 2003; Micco et al., 2003).

The theoretical model and the related empirical literature conclusions are directly used to formulate the hypotheses that are tested empirically using a fixed effects panel estimation. The regression analysis makes use of an unbalanced panel of firm level data for 29 countries from the Eastern European and Central Asian region for the period 2003-2013. The dataset obtained, is the Business Environment and Enterprise performance Survey (BEEPS) which contains a comprehensive overview respective countries' industries including firm characteristics on financial performance, ownership structure, factor employment etc. This thesis finds strong evidence for the mechanism described by Melitz (2003) to hold as trade liberalisation through ceteris paribus increase in industry export intensity unanimously leads to higher industry average profits. The evidence for EMU having a similar effect on the recent entrant countries however, is weak. This thesis then extends the analysis by examining whether the relationship between trade liberalisation and industry profits is intensified by distinguishing between sectors according to the Heckscher-Ohlin predictions. The results show some

[5] http://www.economist.com/news/europe/21603034-impact-rise-anti-establishment-parties-europe-and-abroad-eurosceptic-union

evidence for complementarity between the Melitz (2003) and the Heckscher-Ohlin model however the evidence for EMU having a similar effect is again weak.
The remainder of the paper is organised as follows. Section 2 describes different tranches of empirical literature and how they motivated my research. Section 3 presents a sketch of the underlying theoretical model of Melitz (2003) and outlines the hypotheses. Section 4 describes the data used and variables' construction. Section 5 presents the methodology and explains the empirical findings. Finally section 6 concludes.

2. Empirical Literature

Given the fact that recently, the disadvantages of joining the Eurozone have been heavily highlighted by the media and the Eurosceptic political parties, the effect of EMU on the entrant countries' industries a very interesting topic to study especially as the underlying model by Melitz (2003) points out some clear microeconomic benefits. Prior to the analysis, this thesis first establishes what the benefits and the costs of being a part of the EMU are and how these could affect industry structure in those countries.

2.1 Benefits of the EMU

The primary argument in favour of joining the EMU is the reduction of barriers to trade through elimination of transaction costs. International sales between Eurozone countries do not have to be handled in different currencies therefore any costs associated to the bid-ask spread in exchange rates can be disregarded. This directly reduces the monetary costs associated with exporting which should in effect reduce prices and increase demand for exports (Allington et al.,2004).
Secondly, price transparency increases the exposure of entrant country firms to foreign markets and stimulates healthy competition as goods prices are more comparable for consumers. The increased international exposure in effect increases the firms' potential target market thus increases the demand for exports from exporting firms in the entrant country as well as triggering international sales for non-exporting firms as argued by Baldwin, Skudelny and Taglioni (2005) and Baldwin (2006).

Further benefit of the monetary union includes price convergence. Elimination of the aforementioned transaction costs and aiding price transparency should in effect trigger more price competition within the Eurozone. As formulated by Pavcnik (2002), an increased exposure to international competition should force companies to "trim their fat", having a downward effect on the prices thereby increasing consumer surplus. Allington, Kattuman and Waldmann (2003) studied the effect of introducing common currency on rendering the law of one price. They used the comparative price level data (CPL) of 200 product groups for fifteen EU countries in the period 1995-2006. Their tests produced robust results showing that monetary union did in fact trigger price convergence within the EMU countries relative to non-EMU countries. They use this as evidence to conclude that prior to joining the currency union the exchange rate risk served as a blockade to price convergence. It is however important to establish whether commodity prices converged towards their lowest respective prices in the Euro area. Such scenario would pose the most welfare benefits to consumers as convergence would stem from competitive rather than institutional forces.

Furthermore firms already involved in international trade within Europe would no longer suffer from exchange rate risk. Stability of the exchange rate is vital for international trade as in many studies it

has been shown that, having a volatile exchange rate has negative effect on a country's level of exports (Arize, 1998; Dell'Ariccia, 1999; De Grauwe, 1988). Stability of the currency means that firms do not feel the necessity to perform currency hedges in order to limit downside risk. One of the main appeals of joining the Eurozone is the stability it brings, making firm profits less volatile thereby not discouraging firms from exporting. As well as limiting exchange rate risk due to the Euro exchange rate stability, the exchange rate risk is completely eliminated for intra-Eurozone trade. Multiple studies attempt to address the question of exchange rate volatility and the extent of its effect on aggregate trade flows. Dell'Ariccia (1999) for example examines 15 countries that belonged to the European Union at the time and Switzerland for the period 1975-1994. The author finds that for any measure of volatility and any specification, taking into account all variables from a standard gravity model, the effect of exchange rate uncertainty on bilateral trade is consistently and significantly negative. This indicates that firms are less likely to engage in international trade if the exchange rate is more volatile. It can be however be argued that the effect is not negative for all countries or industries. For instance Arize (1998) looks at eight European countries and finds that for six, the exchange-rate volatility has a significant negative effect on the volume of imports however for Sweden and Greece, the effect is positive. Although exchange rate risk cannot with certainty be concluded to have a negative effect on exporting, most studies indicate that the negative effect is in fact more plausible for European countries thus posing a further benefit of joining the Euro. The argument of elimination of exchange rate risk yielding a significant benefit can be fairly scrutinized by the theory of perfect hedge. The theory explains that exchange rate risk can be countered by taking a short position on foreign currency for exporters and a long position for importers, thereby removing uncertainty from exchange rate movements. The theory however does not always hold in reality as exchange rate hedges with maturities exceeding one year tend to be hard to come by (HM Treasury, 2003). In addition to that, the time and knowledge required to perform currency hedges pose an additional cost therefore joining the EMU does at least to an extent reduce costs associated to exchange rate risk.

Further benefits stem from the institutional set up of the monetary union. Prior to financial crises of 2008 the euro was portrayed as one of the most stable currencies, with the Maastricht treaty laying out specific criteria that would ensure its stability. We now know that certain criteria that was breached by multiple countries has attributed to the scale of the financial crises. Nevertheless, Rose (2000) pointed out that Europhiles believed that sharing a common currency would further stimulate integration by preventing 'beggar-thy neighbour' policies of external currency devaluations. A monetary union would create a much larger incentive to be fiscally responsible and would therefore support healthy competition in the common market. Frankel and Rose (1998) found that high volumes of trade between countries are positively associated with business cycle synchronisation. This result supports the argument that higher intra-Eurozone trade through adoption of the common currency, would implicitly make itself more sustainable through business cycle synchronisation thus stimulating even more integration (Rose, 2000). Given the fact that under the EMU the monetary policy is a shared policy, the ECB would have to comply with the strict stability mandate set by all members, which would lead to a more stable and credible monetary policy than any one country would set. To sum up, adopting a common currency should presumably make countries more fiscally responsible, making them less prone to asymmetric shocks as well as having a more effective common monetary policy. This should in effect create a self-reinforcing stable and healthy macroeconomic environment which should further facilitate intra-European trade and competition. Walter (2009), the chief economist of the Deutsch Bank in his research states that "the stability arguments are increasingly attractive as the

immediate effects of the financial crises have been substantial". Moreover, in contrast to non EMU members who struggled to get foreign financial support following the financial crises, the most recent small entrants including Cyprus, Malta, Slovakia and Slovenia seemingly benefited from the luxury of having access to Euro capital markets.

Overall the aforementioned benefits that include elimination of transaction cost, exchange rate risk and volatility, price transparency, price convergence and macroeconomic stability should in practice increase intra-euro bilateral trade and therefore joining the EMU can be considered a trade liberalising process.

2.2 Costs of the EMU

The disadvantages of monetary union are a little bit more clear-cut. The most obvious is the loss of monetary policy tool which can pose serious obstacles if the economic situation requires such intervention. One can approach this analysis by looking at the theory of 'Optimal Currency Area' pioneered by Mundell (1961) which helps us establish whether an economic area is fit for a monetary union and assess the economic risks involved. The theory outlines multiple criteria for a currency union to be considered optimal, the European Monetary Union being a prime example of such analysis. The criteria includes high mobility and flexibility of labour, capital, prices and wages in order to allow the market forces to redistribute resources across countries thereby maintaining a balanced economic system that is not prone to asymmetric shocks. It also requires the countries to share currency risk. This means that if necessary, there would be a fiscal redistribution from budget surplus countries to deficit countries in order to stimulate the economic balance. And finally OCA requires a convergence of business cycles in order for countries to allow them to synchronise their interest rates.

In light of the international financial crises, extensive amount literature pointed out the institutional flaws in the EMU and scrutinised the position that Eurozone is an optimum currency area (De Grauwe, 2013). Krugman (2012) pointed to two fundamental grounds where the EMU fails to adhere to OCA prerequisites. Firstly the Eurozone does not have perfect labour mobility which can be attributed to language barriers, continued labour market rigidity in many countries and their reluctance to undertake necessary reforms to make them more flexible. Secondly it fails on the grounds of shared fiscal responsibility. Countries within the Eurozone very much still act as sovereign states, where surplus countries face huge opposition against fiscal transfers to deficit regions. Moreover unlike in the United States the fiscal transfers across countries are not done at a centralised level but instead are handled as loans intensifying deficit countries' sovereign debt crises. The OCA analysis thus helps us identify the possible detrimental effects brought on by asymmetric shocks if the common currency area is not equipped to deal with it.

This was perfectly exemplified by the recent financial crises and the forthcoming events that had damaging effects on various economies, namely around the European periphery. Inappropriately low borrowing rates as well as some countries' infringement of fiscal responsibilities has led to the formation of various financial bubbles that those countries were ill-prepared to deal with once the bubbles burst. Following those events, the balance of payments imbalance across European economies meant that southern European countries struggled to remain competitive on the international markets. Eleftheriou (2003) found that the southern European countries which include Greece, Spain and Portugal had inappropriately low interest rates whilst at the same time they were

the countries with relatively low price levels in the Eurozone. This led to an above average EMU inflation rate and facilitated price convergence which was suggested to be one of the benefits of joining the monetary union. We now know that price convergence stemming from artificially low interest rates rather than competitive forces attributed to these countries' loss of competitiveness and hence contributed to their current financial hardships. Moreover the ECB's relaxed stance on the infringement of the inflation target criteria by these countries exacerbated the asymmetric shock of the global financial crises, thereby invalidating the argument that euro adoption would lead to self-reinforcing mechanism of mitigating asymmetric shocks.

An alternative response in such scenario would be for a country to externally devalue their currency in order to regain competitiveness on international markets. This policy prescription no longer being available to member states within the EMU posed problems as countries had to undergo internal devaluation through heavy austerity measures that were found neither to be very effective in countering the debt crises nor sufficiently improving competitiveness (Sinn, 2014). Although such events could induce the weakest, least productive firms to go out of business, the lack of demand and unreasonably high real wages could induce even fairly productive firms to die. This would not pose a problem per se if this was followed by reallocation of resources i.e. labour and capital, as predicted by Melitz (2003). However as we have seen, in the case of the southern countries the financial crises led not to the reallocation of resources, but to the displacement of resources. This was shown by massive unemployment rates and drying up of available credit seen in southern European countries.

It is important to acknowledge that joining the EMU comes with significant benefits that stem from increased competition in goods markets. However if countries do not comply with stability and convergence stimulating criteria, as well as institutions are not set up to ensure the European economy is balanced, European economies will be exposed to macroeconomic risks that could trickle down to firm-level and may potentially exceed its benefits.

2.3 Trade effects of EMU

In the following section this paper is going to summarise the literature that tried to study the trade effects of EMU accession and justify why the approach in this thesis is a suitable addition to the existing studies. Due to the fact that increasing intra-European trade was one of the main objectives to further European integration project, large amount of literature has aimed to address this question and quantify these trade effects. The establishment of the European Monetary Union in 1999 opened up a new tranche of international trade research in the spectrum of common currency areas.

The study by Rose (2000) has become a revolutionary research paper that has sparked a big backlash of corresponding literature. At the time the paper was often used as justification for adopting a common currency as the results showed that adopting common currency increased bilateral trade within the common currency area by 235%. However the methodological approach of the study has come under scrutiny and subsequent research has aimed to study the legitimacy of the so called 'Rose effect'. The key critiques of the study include the fact that less than one percent of the sample of countries shared a common currency and the fact that the study does not address estimation problems such as causality which may have led to unreliable results. Moreover, majority of the countries with a common currency were small and poor states therefore it poorly reflects the effects

EMU would have on intra-European trade. Rose and Van Wincoop (2001) attempt to partially solve the empirical problem pointed out by correcting for country-specific fixed effects. This reduced the aforementioned effect to about 135%. Studies such as Micco et al. (2003) aimed to downplay the 'Rose effect' for the Eurozone and estimate it to be somewhere around 6% boost in trade. Flam and Nordström (2003) applying a different estimation technique and only considering countries within the EU, estimate the effect to be around 8%. Similarly Belke and Spies (2008) by overcoming estimation biases with relation to endogeneity, selection and omitted variable estimate that the Euro facilitated a 7% increase in intra-European trade and also forecast a similar effect to occur for future CEE entrants.

Brouwer, Paap, Viaene (2007) consider the trade and FDI effects of potential EMU enlargement. Taking into consideration the 10 countries that entered the EU in the 2004 phase, using a simulation technique of a general equilibrium model they find positive relationship between FDI inflows and trade with respect to adopting the euro. More specifically they find that the euro directly affects trade though microeconomic benefits of the euro currency and indirectly due to increased levels of FDI inflows.

In his paper, studying the EMU's trade effects in association with the European Central Bank, Baldwin (2006) thoroughly critiques the above studies that followed Rose (2000) and points out the methodological and data flaws present. An interesting limitation includes the 'Rotterdam effect'. He argues intra-European data was heavily distorted by the inefficiencies of the TIR system.[6] The so called 'Rotterdam effect' points out that a bulk of the imports shipped to Europe through the Netherlands were counted as imports to the Netherlands despite the fact it was only a transit destination. The problem arose when the cargo was then shipped to its final destination within the EU, the goods were counted as exports from the Netherlands to its respective EU countries thus inflating the volumes of intra-EU trade relative to extra-EU trade. Taking many studies into account, Baldwin (2006) concludes that the euro has according to the best estimations boosted trade by five to ten percent however information on aggregate trade data at that point was not sufficient to answer the question with certainty.

A bulk of previous literature concerning the trade effects of EU and or EMU accession have been studied through using aggregate trade data to estimate aggregate trade effects. However not many studies have addressed this question with the aid of firm level data. Studies such as Baldwin and Nino (2006) based their theoretical method on Melitz (2003) however despite the authors' own preference in using firm level data, due to its unavailability they resorted to using disaggregated bilateral trade data. In the paper's conclusion, Baldwin (2006) emphasises that the question of *"how much did euro boost trade?"* is the wrong one to ask as the answer varies depending on the sector, the country and the year. Therefore the question of *"how big is the magic?"* is difficult to answer as an aggregate figure. He suggests that a better question would be *"If the euro boosted trade by sharpening competition, then in which dataset should we find the footprints?".* The research in this thesis will therefore shift the focus from the former to the latter question. With the aid of extensive firm level data for Eastern European and Central Asian countries and the underlying theoretical model of Melitz

[6] The TIR system refers to 'Transports Internationaux Routiers' which is a customs convention on the international transport of goods

(2003), this paper formulates hypothesises with an aim to test the model's predictions on the microeconomic effects of trade liberalisation.

Overall the extensive literature studying aggregate trade effects of the EMU has reached a consensus that adopting a common currency in the form of the Eurozone has unanimously increased intra-European trade. Therefore, given that joining the EMU has reduced multiple barriers to trade and boosted trade, we can interpret entering the EMU as a process of trade liberalisation. In the following subsection, this paper looks at various empirical literature that aims to study the microeconomic effects of trade liberalisation and further motivates the methodological approach in this thesis.

2.4 Trade Liberalisation and firm productivity

There has been an abundance of studies which researched trade liberalization effects on aggregate trade flows through employing a gravity type formula and using aggregate bilateral trade data. The scarcity of firm level data meant that microeconomic policy prescription was often based on macroeconomic evidence. In order to design a sound trade liberalisation policy, it is important to complement macroeconomic results with firm level evidence which give us a bit more insight into where the productivity growth derives from.

Given the variety of trade liberalising policies, research papers studying the effects of trade liberalisation on firm productivity gains have usually shifted focus on one particular country which has undertaken country specific policies. For example Pavcnik (2002) studies the effects of reduction of tariffs and non-tariff barriers on the evolution of plant productivity in Chile. The author pays particular attention to the methodology as it tries to overcome estimation problems encountered in previous studies. The production function is estimated semi-parametrically in order to overcome selection and simultaneity bias in the estimates of the input coefficients that are required to construct a productivity measure. The author uses data of Chilean manufacturing firms for the years of 1979-1986. Chilean manufacturing sector has been the subject of a lot of research not only due to the quality of its firm level data but also because during the 1970's the country has gone through an enormous trade liberalization process at which time it eliminated virtually all non-tariff barriers and substantially decreased its tariff rates. The results found indicate that following the trade liberalization process, Chilean firms on average increased their productivity by 19%. This was 6.6% due to general productivity growth and 12.7% attributed to the intra industry reallocation of resources from least to the most efficient firms. The result is in line with the hypothesis of Melitz (2003) theoretical model implemented in the study as it supports the notion that trade barriers in Chile enabled less efficient firms to coexist with more productive firms, some of which did not survive following trade liberalisation. Furthermore the author finds that the productivity gains occur the most in import competitive sectors but are negligible in non-traded goods sectors.

Topalova (2004) studies the effect of India's trade reforms in the 1990's on the firm productivity of the Indian manufacturing sector. In line with Olley and Pakes (1996) and Levinsohn and Petrin (2003) the paper constructs a consistent measure for TFP by overcoming simultaneity problems found in earlier studies. Assuming a Cobb-Douglas production function the total factor productivity is calculated to serve as a firm productivity index. The dataset covers over 4000 manufacturing firms for the years of 1989-2000. The estimation takes into account other policies that may have affected

productivity and came into effect simultaneously however the coefficient of interest is the one on lagged trade protection, looking at its magnitude and sign. The key finding of the study is that a 10% reduction in tariffs on average leads to a 0.5% increase in productivity ceteris paribus. This results is statistically significant and robust across various regression specifications. Furthermore the author finds that lower trade protection not only has a positive effect on productivity level but also on productivity growth. Both results are more significant for private companies in comparison to government enterprises. Given the fact that the exit rates of firms in the sample is relatively low, higher average firm productivity is only partially driven by intra intra-industry resource reallocation as shown by Melitz (2003). Thus the conclusion of the study is that, the average firm productivity growth predominantly stems from taking advantage of economies of scale leading to within firm productivity increase.

Fernandes (2007) adds to the extensive related literature by analysing the effect of trade liberalisation, namely the multiple phases of tariff reductions, on Colombian manufacturing plants. The paper also follows the methodology of Levinsohn and Petrin (2003), using an unbalanced panel of over 6000 firms for the period 1977-1991 then analyses the effects of the aforementioned various phases of tariff reductions. The main findings of the study are the following: Large plants on average increase their productivity substantially more in response to tariff reductions than small plants, on average 68% of the average firm productivity increase is due to intra-firm productivity increase. Evidence is also found to support the Melitz (2003) hypothesis that following trade liberalisation the average firm productivity rise also stems from intra intra-industry resource reallocation.

Amiti and Konings (2007) contributes to the literature by paying special attention to the inputs tariff levels and how its reduction leads to substantial productivity gains for Indonesian plants in the period of 1991-2001. In line with the Olley and Pakes (1996) methodology they estimate the residual TFP and find that a 10% reduction in input tariffs leads to a productivity increase of 12% for firms that use foreign inputs in production. On the other hand, the effect of reducing output tariffs by 10% has an estimated increase in productivity of only 1 to 6 percent. They conclude that the productivity gains are much larger for input importers due to the fact that foreign inputs are of better quality, provide more variety and produce significant learning effects.

As the theoretical models namely Melitz (2003) predict trade liberalisation leads to higher export intensity among firms however prior to estimation of the productivity gains it is important to establish why exporters are structurally more productive. There exist two baseline theories on why exporters are on average more productive than their non-exporting domestic counterparts. One hypothesis suggests that the choice of exporting is a self-selection process. Firms realise there are opportunities to satisfy excess foreign demand and make additional profits from abroad. However they also acknowledge that exporting means they incur higher costs through transportation, market research and fixed entry costs. This theory therefore proposes that exporters are more productive ex ante and thus self-select themselves into exporting due to their superior productivity. Second theory on the other hand highlights the learning-by-doing effect. Firms that enter foreign markets are exposed to fiercer competition thus have to react quicker to changing market conditions than their domestic non exporting counterparts. Furthermore exporters benefit from knowledge spillovers that stem from international buyers and competitors hence are able to improve their productivity post entry. Wagner (2007) reviews and assesses post 1995 studies that address these hypotheses by looking at various

estimation methods and empirical findings. He points out that most studies look at the differences in labour productivities or differences in average TFP between exporters and non-exporters. [7] These are then used to compute the export premia as the ceteris paribus percentage difference of labour productivities between exporters and non-exporters. With the help of longitudinal data one can look at the productivity difference between non exporters and exporters ex ante exporting and compare the results with ex post exporting results. Through the analysis of many different studies the author comes to the conclusion that the difference in firm productivities of exporters and non-exporters is predominantly due to the process of self-selection, indicating that exporting does not necessarily improve productivity.[8] This is in line with the Melitz (2003) theoretical model which determines the cut-off productivity parameter for exporting is strictly higher than the cut-off productivity parameter to supply the domestic market which is due to the additional costs incurred by exporting.

The final paper taken into consideration is by Cieslik et. al (2014) who study the effect of CEE countries joining the EU and the EMU on export activity of individual domestic firms of the entrant countries. In line with this thesis, they use the BEEPS firm level data using a baseline theoretical model of Melitz (2003). [9] Their empirical methodology consists of a Probit model through which they show that accession of CEE countries into the single market and currency union has had a positive effect on firms' propensity to export. They determine that firm level characteristics including firm productivity proxied by total annual sales per full time employee, firm size, firm age, use of foreign technology in production and expenditure on R&D have a positive effect on the likelihood of a firm exporting. Moreover the crucial finding of the study is that the EU and EMU dummies show to be statistically significant in determining the firm propensity to export. The magnitude of the EMU variable is roughly twice the size of the EU dummy implying that joining the monetary union is more vital in increasing the probability of a firm exporting. This suggests that entering EMU following eastern European countries' accession into the EU is a logical step given the benefits that can be reaped from an increased level of exports.

3. Hypothesis

3.1 Theoretical Model

The empirical analysis conducted in this paper is predominantly based on the theoretical model developed by Melitz (2003) and the hypotheses outlined are accordingly based on the model's conclusions. The paper develops a dynamic model which explains the impact of trade on the intra-industry reallocations and aggregate industry productivity. By incorporating firm heterogeneity with respect to firm total factor productivity, Melitz makes a fundamental extension to the model developed by Krugman that considers trade due to monopolistic competition and increasing returns to scale.[10] The extension however is very easy to manipulate and work with as it is then represented by a single parameter of average firm productivity. In effect, the model with firm heterogeneity is able

[7] Labour productivity is traditionally measured by value of shipments per worker or value added per worker.

[8] Evidence for self-selection into export markets is found empirically in the following papers: Alvarez and Lopez (2005) (for Chile), Damijan et al. (2004) (for Slovenia), Farinas and Marcos (2007) (for Spain), Bernard and Jensen (1999) (for the US)

[9] BEEPS refers to the Business Environment and Enterprise Performance Survey

[10] Model extension refers to Krugman (1980)."Scale Economies, Product Differentiation, and the Pattern of Trade,"

to yield the aggregate outcomes similar to those that use a representative firm. However, the composition of the average firm can change in the setting by Melitz (2003). Thus, incorporating firm heterogeneity into the model allows one to explain how industry aggregate productivity is endogenously determined. For simplicity, the model assumes Dixit-Stiglitz type preferences characterised by a consumer's 'love of variety'. This means that a consumer gains a higher utility the more varieties are consumed within the same quantity units. Moreover using such preferences means the firm mark-ups are exogenously determined by the symmetric elasticity of substitution parameter. Assuming these type of preferences alongside increasing returns to scale ensures that there will be intra-industry trade between identical countries in this setting.

With the assumptions and the model dynamics outlined, this leads to a very interesting assessment of the effects of trade liberalisation. In particular the model illustrates how opening up to trade and thus being exposed to fiercer competition from abroad, leads to an increase in the cut-off productivity parameter. Subsequently this induces the least productive firms to exit the market as they can no longer earn enough revenue to cover their costs. In effect trade liberalisation triggers intra-industry resource and profit reallocations from the least to the most productive firms as the factors displaced by the exiting firms are employed by the remaining most productive firms who are in a better position as a result of opening up to trade. This has a positive impact on the industry average productivity, as the model explains that trade liberalisation directly alters the free entry condition and effectively leads to an industry consisting of a more productive pool of firms. Due to a further assumption of relatively higher costs associated with exporting, only the most productive firms enter the export market and benefit from the additional foreign demand. To summarise, the fundamental conclusion of the model is that trade liberalisation leads to a higher industry average productivity and higher industry average profits which yields positive aggregate welfare gain.

In this section I am going to outline the main equations, namely the zero cut-off condition and the free entry condition in autarky as well as in the open economy. The equations are then combined to determine the entry cut-off productivity threshold, average productivity parameter and the export cut-off productivity threshold. This thesis only provides a sketch of the Melitz (2003) setting thus one should refer to the original for further details and derivations.

3.1.1 Closed Economy Equilibrium

The model begins the assessment by assuming an infinite number of potential entrants to the industry. Successful entry is then characterised by a two-stage process. In the first stage an entrant firm enters the market and incurs fixed entry costs. These are indicative of initial investment used for building up the retail channel or building a factory or any other sunk costs which are necessary before the business is able employ factors of production. In the second stage a productivity parameter φ is drawn from an exogenous distribution $g(\varphi)$ within an interval $\left[\underline{\varphi}, \overline{\varphi}\right]$. The two stage process described is a plausible assumption given the fact that in reality, firms also only employ labour after a firm is established and production facilities have been built. In addition, prior to factor employment the firm is unaware of their productivity therefore overall firm productivity is ambiguous. Following the second stage, based on the drawn productivity parameter, a firm decides whether to start production and incur the fixed production costs and marginal costs or exit the market completely. The decision is based on the zero cut-off profit condition which determines the threshold entry productivity parameter. If the productivity parameter drawn is below the cut-off level, the firm exits the markets as the total revenues are not high enough to cover fixed costs hence the firm would make negative

profits. However, if the productivity parameter drawn is above the threshold level then the firm decides to enter the market as it is able to make positive profits[11]. Once the firm draws a productivity that is above the entry threshold, they stick to a constant productivity infinitely which also means they have the same profits in each period thereafter. In order to model a constant flow of entering and exiting firms, the model makes an assumption of a constant exogenous probability θ of a negative shock for each period. This is a valid assumption as the negative shock could constitute a regulation change or a change in consumer's preferences which is a plausible occurrence in reality. It is important to note that the average productivity of the dying firms each period is equal to the average productivity of entrant firms. The zero cut-off profit condition is given by the following:

(3.1)

$$\pi(\varphi^*) = \frac{r(\varphi^*)}{\sigma} - f = \frac{p(\varphi^*)^{1-\sigma}.P^{\sigma-1}.I}{\sigma} - f = 0$$

Following the zero cut-off profit condition we assume a new distribution $\mu(\varphi)$ for all firms that successfully entered the market which is the truncated distribution of $g(\varphi)$ on the sub-interval $[\varphi^*, \overline{\varphi}]$. The average firm productivity parameter $\tilde{\varphi}$, which implies that the model with heterogeneous firms and the one average firms lead to identical aggregate outcomes is given by:[12]

(3.2)

$$\tilde{\varphi} = \left[\int_{\varphi^*}^{\overline{\varphi}} \mu(\varphi).\varphi^{\sigma-1}\, d\varphi \right]^{\frac{1}{\sigma-1}} .$$

Given the fact that the average productivity parameter $\tilde{\varphi}$ is purely determined by the cut-off productivity threshold φ^*, the profit of the average firm can be expressed by the following[13]:

(3.3)

$$\bar{\pi} = \pi(\tilde{\varphi}) = \left[\frac{\tilde{\varphi}}{\varphi^*}\right]^{\sigma-1} . \frac{r(\varphi^*)}{\sigma} - f \, .$$

We can now make a further assumption that firms are indifferent between paying the one-time sunk market entry costs of f_e or paying the per period equivalent of the sunk market entry costs f_{PPE} each period it is active. Incorporating the earlier assumption of exogenous probability θ of negative shock each period, we determine firm probability of survival each period as (1-θ) and the per period equivalent of the sunk market entry costs is then given by:

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[11] $\underline{\varphi} \leq \varphi < \varphi^* \rightarrow \pi < 0 \rightarrow$ Firm Exit

$\varphi = \varphi^* \rightarrow \pi = 0 \rightarrow$ Firm is indifferent between starting with production and exit

$\varphi^* < \varphi \leq \overline{\varphi} \rightarrow \pi > 0 \rightarrow$ Firm starts with production

[12] The first derivative of **equation 3.2** with respect to productivity threshold is strictly positive indicating that as φ^* increases, the average productivity parameter $\tilde{\varphi}$ increases accordingly. This proves the positive impact of productivity threshold on the average productivity parameter.

[13] Given the fact that $\varphi^* < \tilde{\varphi}$ and $\sigma > 1$, the scaling factor is strictly larger than unity: $\left[\frac{\tilde{\varphi}}{\varphi^*}\right]^{\sigma-1}$>1.

(3.4)

$$f_{PPE} = \theta . f_e \, .$$

The relationships determined above can be used to formulate a free entry condition, which explains that a firm is only willing to incur sunk market entry costs and proceed to draw a productivity parameter if the expected profits of market entry are equal or larger than the per period equivalent of the sunk market entry cost. The free entry condition in the closed economy is therefore given by:

(3.5)

$$[1 - G(\varphi^*)] . \pi(\tilde{\varphi}) = \theta . f_e \, ,$$

Where the term in the squared brackets on the left hand side denotes the probability of a successful market entry and the second left hand side term shown as the function of average productivity parameter denotes the average profits of all active firms. Accordingly the potential entrant expects this value to be at least equal to per period fixed sunk market entry costs.

In equilibrium the zero cut-off profit condition (ZCP) and the free entry (FE) condition can be rearranged to determine the relationship between the average firm profits and the cut-off productivity threshold parameter shown by equation 3.6 and 3.7 respectively:

(3.6)

$$\bar{\pi} = f . \left(\left[\frac{\tilde{\varphi}}{\varphi^*} \right]^{\sigma - 1} - 1 \right)$$

(3.7)

$$\bar{\pi} = \frac{\theta . f_e}{1 - G(\varphi^*)}$$

The free entry condition can be rewritten to incorporate the average profits equation (3.3) and the zero cut-off profit condition (3.6). The free entry condition is then transformed into:

(3.8)

$$[1 - G(\varphi^*)] . \left(\left[\frac{\tilde{\varphi}}{\varphi^*} \right]^{\sigma - 1} - 1 \right) . f = \theta . f_e$$

It can be seen that the average profit equation depends on the average productivity parameter $\tilde{\varphi}$ and the cut-off productivity parameter φ^*. Since the average productivity parameter depends on the threshold productivity parameter, this equation can be solved for the threshold productivity parameter.

3.1.2 Open Economy Equilibrium

As an economy opens up to trade, the model makes further assumptions of the nature of the costs associated with exporting. Iceberg transport costs τ are assumed to be strictly larger than one which implies that from $q(\varphi)$ units which are shipped, only $q(\varphi)/\tau$ units arrive abroad. This in effect means that the price per unit imported good increases by τ and the marginal costs for supplying foreign markets increase relative to domestic sales. Secondly the model assumes that exporters incur per period fixed production costs for serving foreign market f_x which are assumed to be larger than the domestic fixed production costs i.e. $f_x > f$. The above assumptions which imply higher relative costs of exporting are key to instigating the resource reallocation mechanism, as without them the

composition of firms within an industry would not change as a result of trade liberalisation. Further simplifications of the model include that countries trading are symmetric.[14] Taking all the assumptions into account one can now establish the zero cut-off profit condition for supply of the foreign market. This looks very much like the zero cut-off profit condition for the domestic market but incorporates relevant costs of exporting and is given by:

(3.9)

$$\pi_X(\varphi_X^*) = \frac{r_X(\varphi_X^*)}{\sigma} - f_X = \frac{p(\varphi_X^*)^{1-\sigma}.\tau^{1-\sigma}.P_F^{\sigma-1}.I_F}{\sigma} - f_X = 0\,.$$

By division of the (ZCP) in equation (3.9) by the domestic market (ZCP), equation (3.1) and rearranging we yield the following ratio:

(3.10)

$$\frac{\varphi_X^*}{\varphi^*} = \tau.\left(\frac{f_X}{f}\right)^{\frac{1}{\sigma-1}}.$$

The above relationship explains that the higher the exogenous values of τ and f_X which are the costs associated with exporting, the higher the relative cut off productivity threshold of exporting in relation to cut-off productivity parameter of domestic market entry. Due to the assumption of a continuous distribution of active firms, this also means the smaller the relative frequency of exporting firms.

In an open economy setting, the expected profits comprise of two components that include the expected profits of supplying the domestic market and the expected profits of supplying the foreign market. In addition to making the decision to start supplying to the domestic market, they consider whether to start exporting which depends on whether their potential revenues from exporting are high enough to cover fixed export costs. The open economy free entry condition is thus determined as a combination of both expected profits and takes the following form:

(3.11)

$$[1 - G(\varphi^*)].\pi(\tilde{\varphi}) + [1 - G(\varphi_X^*)].\pi(\widetilde{\varphi_X}) = \theta.f_e$$

Considering the zero cut-off profit conditions for the supply to the domestic and the foreign market, the open economy free entry condition can be rewritten as:

(3.12)

$$[1 - G(\varphi^*)].\left(\frac{\sigma.f.(\tilde{\varphi}/\varphi^*)^{\sigma-1}}{\sigma} - f\right) + [1 - G(\varphi_X^*)].\left(\frac{\sigma.f_X.(\widetilde{\varphi_X}/\varphi_X^*)^{\sigma-1}}{\sigma} - f_X\right) = \theta.f_e$$

Where $\widetilde{\varphi_X}$ equals the average productivity parameter for all the exporting firms.

In comparison to the closed economy free entry condition, the additional term included changes the equilibrium levels of cut-off productivity parameter. The expected profits of supplying the foreign market are strictly positive therefore the left hand side of the equation increases. In order to maintain the balance and for the equilibrium condition to hold, the cut-off productivity parameter for domestic market entry φ^* has to increase to make the first component of the left hand side smaller. Intuitively, opening up to trade increases competitiveness on the domestic market, given the relatively more

[14] This includes that countries are have identical wage rates which are normalised to one and also the same aggregate variables.

productive foreign firms are able to sell in the domestic market. Due to the 'love of variety' preferences of consumers, the demand for domestic goods decreases as domestic demand is partially shifted towards foreign firms. This in effect means that the least productive domestic firms are unable to earn enough revenue to cover fixed production costs and are thus forced to exit the market. In the subsequent period, only relatively more productive firms are willing to enter the market given only they can still cope with an increased international competition.

As discussed previously, the costs associated with exporting are higher than those of supplying the domestic market, therefore by principle export cut-off productivity parameter φ_X^* is higher than the domestic cut-off parameter $\varphi_X^* > \varphi^*$. This ensures that only the most productive domestic firms can afford to export.

As a result of trade liberalisation, the increase in the cut-off productivity threshold parameter φ^* directly leads to an increase in the industry average firm productivity level $\tilde{\varphi}$ and also an increase in the industry average firm profit level $\bar{\pi}$. It is important to note however, that some firms are adversely affected by trade liberalisation. It is not only the least productive firms that exit the market that are disadvantaged by open trade. Following trade liberalisation, firms with the productivity parameter in the interval $\varphi^* < \varphi < \varphi_X^*$, are productive enough to enter the domestic market but are not productive enough to enter the export market. In comparison to the closed economy setting these firms are adversely affected in terms of revenues due to a more intense goods and factor market competition. To reiterate, given consumers have a 'love of variety' the demand for domestic goods partially shifts to foreign goods which means domestic firms earn less revenue from domestic sales on average. This also means that the non-exporting active domestic firms lose in terms of both market share and profits. The effect of trade liberalisation on exporters whose productivity is in the interval $\varphi_X^* < \varphi < \overline{\varphi}$ is positive in terms of market shares but varying in terms of profits. Although domestic firms face fiercer competition from abroad, exporting firms increase their market shares by penetrating foreign markets. However for the least productive exporting firms, so the firms just beyond the export cut-off productivity threshold φ_X^*, the loss of revenue and profit from domestic sales as a result of more intense international competition exceeds the gain in revenue and profit from supplying foreign markets thus in total they are less profitable as a result of trade liberalisation. The most productive exporting firms however, gain not just in terms of market share but also in terms of profits as for these firms, the additional revenue from supplying foreign markets exceeds the loss of revenue from domestic sales and as a result they are more profitable following trade liberalisation.

The most productive firms which experience higher aggregate demand for their goods employ more factors of production which were displaced from the least productive firms exiting the market. In effect the most productive firms become structurally larger in terms of market shares, revenues, profits and factors employed.

To summarise, trade liberalisation leads to an increase in the domestic cut-off productivity threshold which in effect instigates intra-industry resource reallocations from the least to the most productive firms, then directly leads to the average firm being more productive and due to the positive relationship between average firm productivity and average firm profits, the average profits increase as well. The overall trade liberalising process resembles the Schumpeterian picture of creative destruction where the least efficient firms go bankrupt and the most efficient firms flourish.

The model then allows the analysis of further increases in exposure to trade and how it will affect the composition of firms within the domestic market and their profitability. Further exposure to trade can occur through decreasing the costs associated with exporting such as the iceberg transport costs τ and fixed export costs f_x. This may for example happen by adopting a common currency with a country's trade partners which eliminates transaction costs related to exchange rates. Furthermore it can be argued that entering a customs union and converging to a common regulatory standards reduces relative export costs as well. Nevertheless this has a direct negative effect on the export cut-off productivity parameter φ_X^*, meaning more domestic firms are induced to enter the export markets as the reduction in fixed export costs poses a higher profit opportunity for domestic firms. The reduction in export costs also applies to foreign firms selling to the domestic market therefore further intensifying competition at home. As a result, the domestic cut-off productivity parameter increases as well and instigates a mechanism of resource reallocation from the least to the most productive firms. Overall further exposure to trade through reduction in fixed export costs decreases the export cut-off productivity parameter φ_X^*, increases the domestic cut-off productivity parameter φ^* , which increases the average productivity parameter of domestic firms, increases the average firm profits and increase the proportion of firms active in the export market thereby increasing industry average export intensity.

3.2 Hypothesis

Using the Melitz theoretical framework explained above, this paper outlines several hypotheses designed to test the model's conclusions, namely the effects of trade liberalisation on the industry average profits and industry average export intensity. Hypotheses are also formulated with regards to a complementary Heckscher-Ohlin international trade model. Incorporating the two theoretical frameworks, the paper tests whether the Melitz relationship between trade liberalisation and firm profitability is intensified using conclusions proposed by Heckscher-Ohlin. This specifically refers to assessing varying gains from trade liberalisation that depend on the production factor intensities of different sectors. In line with the standard method of hypothesis testing, the paper tests whether the variable of interest, the industry average profits as a proxy for average firm productivity, is positively and significantly impacted by different forms of trade liberalisation. The null hypotheses (H_0) thus hypothesizes that the effect of trade liberalisation on the variables of interest is insignificantly different from zero. The alternative hypothesis (H_1) refers to the conclusions drawn by the theoretical models and indicate a significant positive effect on the dependent variables. The hypotheses tested are the following:

1. H_0: Trade liberalization by the means of entering the European Monetary Union, has no effect on the industry average export intensity.

   H_1: Trade liberalization by the means of entering the European Monetary Union, has a positive effect on the industry average export intensity

2. H_0: Trade liberalization by the means of a ceteris paribus increase in export intensity, has no effect on the industry average firm profits.

   H_1: Trade liberalization by the means of a ceteris paribus increase in export intensity, has a positive effect on the industry average firm profits.

3. H_0: Trade liberalization by the means of entering the European Monetary Union, has no effect on the industry average firm profits.

   H_1: Trade liberalization by the means of entering the European Monetary Union, has a positive effect on the industry average firm profits.

4. H_0: The comparative advantage sectors do not gain proportionately more from trade liberalization in terms of industry average profits.

   H_1: The comparative advantage sectors gain proportionately more from trade liberalization in terms of industry average profits.

Empirical analysis in conjunction with the specified methodology is conducted to test the above hypotheses. If the results produce significant evidence to reject the null hypothesis, one can conclude that the theoretical conclusions outlined are validated and that the mechanism of intra-industry resource reallocation does in fact play an important role in increasing the industry average firm export intensity, productivity and profits.

4. Data

As previously mentioned, the empirical analysis in conjunction with theoretical predictions of the Melitz (2003) model, will make use of firm level data to test the above hypothesis. The dataset contains various firm characteristics that in the regression analysis will be used as main variables of interest as well as control variables that incorporate firm heterogeneity. The dataset in question consists of an unbalanced panel for operating firms in the Eastern European and Central Asian countries for the period of 8 different years that include 2003, 2004, 2005, 2007, 2008, 2009, 2012 and 2013.

Given the country sample mainly consists of former socialist countries which have gone through a rapid transformation into free market economies, it makes it a very interesting sample to study the microeconomic effects of trade liberalisation. The dataset was obtained from the Enterprise Surveys, collected by a joint effort the World Bank and the European Bank of Reconstruction and Development, and for the Eastern European and Central Asian region it is also known as the Business Environment and Enterprise Performance Surveys (BEEPS).[15] The full dataset takes into account the following 29 countries: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Macedonia, Georgia, Hungary, Kazakhstan, Kosovo, Kyrgyzstan, Latvia, Lithuania, Moldova, Montenegro, Poland, Romania, Russia, Serbia, Slovak Republic, Slovenia, Tajikistan, Turkey, Ukraine and Uzbekistan. Overall the full sample collected contains information on 21972 firms across 191 different sectors and 29 countries mentioned above. The sectors considered are predominantly in manufacturing but also include many service industries. The firms belonging to a certain sector have a corresponding ISIC 4 digit code that classifies their specific industry affiliation (ISIC Rev.3.1). ISIC industry codes are subdivided into a four-level structure. First of all the category of the highest levels are called sections and indicate a broad industry any given firm is in. For example letter 'C' corresponds to Manufacturing. The first 2 digits of the ISIC code correspond to division of the section a firm is in. This is for instance 13 which would respectively imply manufacture of textiles. The third digit identifies

[15] Online Resource Available at: www.enterprisesurveys.org

the group within the division. The digits 139 for example corresponds to 'Manufacture of Other Textiles'. And finally the last digit identifies the class. As an example, ISIC 4-digit code 1393 corresponds to Manufacture of Other Textiles: Carpets and Rugs. The industry code specification is a very good tool to specify the exact function of the business and thus it is possible to distinguish firms within a very narrow industry specification. In line with the theoretical model, this validates the assumption that firms within the same ISIC code face more or less the same fixed costs. It is also important to note that only firms with 5 or more employees are targeted for an interview and firms with a 100% government ownership are excluded from participation in the survey.

The (BEEPS) dataset is a comprehensive survey of a representative sample for an economy's private sector, thus the average firm in the sample survey is a good representation of the an average firm in the full population of firms in any given industry. The firm level data includes a wide array of information collected and covers various firm characteristics that directly affect the nature of their business. The topics include gender participation, access to finance, annual sales, costs of inputs, workforce composition, bribery, licensing, infrastructure, trade, crime, competition, capacity utilization, land and permits, taxation etc. [16] The variables of interest that were collected include total annual sales, input costs including labour, raw materials, intermediate goods and aggregated energy costs, export shares, year the establishment began operations, foreign equity share, government equity share, number of employees including number of skilled and unskilled production employees, use of foreign inputs and the previously mentioned ISIC industry codes.

The Enterprise Survey data records all monetary values in local currency units (LCU). Thus to make the figures comparable over time and across countries, all sales and cost figures are converted into U.S. dollars. The reason to convert it to U.S. dollars in particular is due to the fact that U.S. dollar is still considered as the world's dominant currency. This is because a bulk of world trade, especially in commodities is still executed in U.S. dollars. Moreover, U.S. dollar can also be considered as a relatively stable currency therefore the high inflation rates many eastern European and central Asian countries experienced can be reflected in the changes in their respective exchange rates against the U.S. dollar. Given the fact exchange rates are constantly changing and firm sales and cost figures are aggregated for each year, these figures are converted with an aid of average yearly exchange rates between each country's respective currency and the U.S. dollar. The official yearly average exchange rates are taken from the World Bank database which defines the variable as an annual average based on monthly averages and expressed in local currency units per U.S. dollar. It is important to note that throughout the time period in question Slovenia, Slovakia and Estonia joined the European Monetary Union and adopted the Euro as a common currency, and this policy is the focal point of the research. The only currency not available in the database is the Uzbekistani Som hence the historical weekly exchange rates are obtained from the Central Bank of the Republic of Uzbekistan and construct the average exchange rate based on monthly averages.

The enterprise survey data collected is used to obtain specific firm level variables which are then used to calculate the average industry-level variables. As discussed earlier, Melitz (2003) theoretical model draws several conclusions about the impact of trade on the intra-industry resource reallocations and

[16] Input costs are reported as aggregates of total annual cost of labour, total annual cost of raw materials and intermediate goods and total annual energy costs.
Workforce composition refers to the survey's reporting of skilled and unskilled production labour and other non-production labour

the aggregate industry productivity. In particular the model describes that a trade liberalisation process, has a significant impact on the cut-off productivity parameter which directly influences the average firm productivity level as well as the average firm profitability. Due to this, the analysis will make use of the data to calculate the industry-level average firm variables as a unit of observation. These are calculated by the method of weighted average specific to a country, industry and year. The weights are established by firm specific market shares in their respective country, industry and year. Market shares are traditionally calculated by the firm total sales shares. This means that a firm whose sales are relatively large with respect to the size of their market will carry a larger weight in calculating the respective industry level average firm variables. The following equation clearly demonstrates how market shares (MS_{jct}) are determined:

(4.1)

$$MS_{ijct} = \frac{TS_{ijct}}{\sum_{i}^{n} TS_{ijct}}$$

The market share of firm (*i)* within an industry (*j)*, country (*c*) and year (*t)* is given by MS_{ijct}. This is calculated by the total annual sales of a firm (*i)* within an industry (*j)*, country (*c*) and year (*t)* divided by the sum of the all firms within the same industry, country and year.

Using sales share as a method of calculating the weighted averages of various variables corresponds to the methodology implemented by many previous empirical studies including Aw, Chen and Roberts (2001). In comparison to taking weighted averages with the aid of employment shares as seen in Aitken and Harrison (2001), this methodology has a clear advantage with respect to the fact that it mitigates input intensity bias. Firms within the same industry can use different technologies thus can have differing labour and capital intensities to produce the same value of output. Using employment shares as a tool for calculating weighted averages of industry-wide variables would inadvertently attribute a larger share to labour intensive firms since they use relatively more labour in their production. The bias would be reversed if capital shares were used as weights. Thus, to mitigate the aforementioned input intensity bias, total market shares are used as weights as this is considered to be the fairest reflection of each firm's significance in their respective markets.

Using the above method all industry, country and year specific average firm variables are transformed into their respective weighted averages. First of all, the main variable of interest is determined which is the industry-country-year specific average firm productivity. Given the fact that there is no standard measure of productivity in the dataset, the data available is used to construct an appropriate proxy of productivity that will allow one to study the effects of trade liberalisation on the industry average firm productivity. As argued by the underlying theoretical model of Melitz (2003), taking the first derivative of profits with respect to the average firm productivity parameter is positive. This means that as the average firm productivity parameter increases as a result of trade liberalisation, the profits of the average firm go up as well. This result has a very logical reasoning since the most productive firms make a better use of given level of inputs to produce a higher value of output than their less productive counterparts. This allows them to either have a higher mark-up and face equal demand or have lower prices and higher demand thus in any case generating higher profits. In line with the model, more productive firms have lower prices which implicitly means they experience a higher demand for their goods thereby yielding higher profits. Many previous empirical papers that studied the effects of trade liberalisation, determined firm productivity level by plugging in the input values in a Cobb-Douglas

type production function and calculating firm specific productivity as the residual TFP (Amiti & Konings (2007), Aw, Chen and Roberts (2001), Fernandes (2007), Pavcnik (2002) Topalova (2004)). However as pointed out by Levishon and Petrin (2002) this estimation methodology is subject to selection and simultaneity bias. However, although using sophisticated econometric techniques can mitigate this problem to an extent, the productivity measure in its best estimation is still just an approximation. Given the fact that profits can be accurately measured with financial data available in the dataset, a major advantage of using profits as a proxy for productivity is that it completely eliminates any estimation problems. Moreover, due to the fact the average firm profit measure distinguishes between industries, the competitive structure of any given sector is controlled for. Since firms within the same industry face the same total demand function, this means that the most productive companies with lowest marginal costs are in fact the most profitable.

Given the theoretical as well as practical justification of the profit-productivity relationship the annual industry wide average firm profits are used as a valid representation for industry wide average firm productivity. Specifically, the profit values are calculated by taking a firm's annual total sales and subtracting the input costs that include the annual cost of labour, annual cost of raw materials and intermediate goods and the annual cost of energy which is an aggregated function of all energy costs including electricity, fuel costs etc. As previously explained all monetary figures including profits are converted from local currency units to U.S. dollars in order to make them comparable across countries and time. The currency converted industry average firm profit is then calculated according to market share weights.

Second variable of interest is the European Monetary Union dummy. As explained in empirical literature section, entering the Eurozone has significant benefits such as elimination of transaction costs and exchange rate risk or price transparency which have been shown to a varying extent, but unanimously increase intra-European trade (Nardis and Vicarelli (2003), Flam and Nordström (2003), Micco et al. (2003), Bun and Klassen (2002), Belke and Spies (2008), Brouwer, Paap, Viaene (2007)). As previously argued, the conclusions of these studies are used as evidence, validating the assumption that adopting a single currency with the country's main trade partners is representative of a trade liberalising policy. In line with the hypothesis, entering the EMU ceteris paribus, should have a positive effect on industry average firm productivity and therefore a positive effect on industry average firm profits as well as positive effect on the industry average export intensity. Thus the coefficient on the EMU dummy is expected to be positive and significant.

Third variable of interest is the industry average export intensity. This variable is constructed for each firm using enterprise survey data recording the proportion of total sales that is exported directly and indirectly. Indirect export share refers to the proportion of exports sold through an export distribution agent. It can be argued that export intensity should only be calculated from direct export shares since indirect exporting is not handled within the firm. However, given the fact that a firm's goods are exported nevertheless, it should not matter if goods are exported directly or indirectly since the sum of both shares properly reflects the size of foreign demand. Moreover since the goods are exported anyway and trade costs are incurred by the distribution agent, it shows that in theory the firm's marginal costs are low enough to sustain competitiveness on foreign markets hence they could potentially handle export distribution themselves. This means the breakup of the supply chain is not indicative of a firm's ability to export. Combining the direct and indirect export shares to calculate firm specific export intensity, consequently the industry average export intensity is calculated using sales

share weighted averages method. The final measure of export intensity lies between range of (0-1) where zero represents no foreign sales and +1 implies all sales are exports to foreign markets. This variable will be tested both as an independent variable to determine what characteristics attribute to its change as well as a dependent variable in other tests to study the impact of trade liberalisation on average firm profits. A ceteris paribus increase in the industry average firm export intensity is clearly indicative of trade liberalisation. This is because when a barriers to trade are reduced, domestic industries face higher international demand for their goods and thus to accommodate to new market conditions, industry export intensity increases. In line with the theoretical hypothesis, the export intensity variable is expected to have a positive and a significant impact on industry-wide average firm profits.

In order to control for the structural differences between firms across industries and years it is essential to include appropriate control variables within the regression analysis. The first control variable used is the industry average age of the firm. This is simply calculated by the difference between the year a firm began operations and the year the survey was taken. Individual firm ages are then used to calculate the industry specific weighted average firm age with the use of sales market shares as weights and then the natural logarithm is taken of the variable. Firm age is expected to have a positive effect on an industry average firm profits as well as the industry average export intensity. This is because older firms have had more time to accumulate industry knowledge therefore have a better market knowhow. Due to the experience mature firms have gained over the years, they were able to implement the most efficient and most profitable business models accustomed to their specific target market, undertake profitable investments and achieve economies of scale having a direct impact on firm productivity (Jensen et al., 2001). Furthermore, over the years, older firms learned which marketing techniques are the most efficient and thus are able to use this knowledge to their advantage. In line with the results of Jensen et al. (2001), the coefficient of firm age is expected to be to be positive and significant meaning learning-by-doing effect being significant in firms improving their productivity. If this hypotheses is validated, in line with Melitz (2003) one should also expect older, more productive firms to have a higher export intensity.

Secondly, the firm size is incorporated into the model to control for any structural impact this may have on the average industry profits. Firm size is measured by the total number of full-time employees from every level of the firm including both paid and unpaid workers. Similarly the industry weighted average firm size is calculated using market shares. The theoretical model of Melitz (2003) explains that trade liberalisation leads to reallocation of resources including labour from the least productive to the most productive plants. Therefore in line with the model, an increase in the firm size with respect to the number of full-time employees is expected to have a positive impact on the average firm profits.

The third control variable included in the tests is foreign ownership. This is calculated as the equity share owned by private foreign individuals, companies or organisations. By definition this means the variable range is between 0 and +1, 0 implying no foreign ownership and +1 signalling 100% foreign ownership. As well as other variables, the industry specific average firm foreign ownership is calculated by the method of market share weighted averages. This is an important variable to include as many previous studies have shown that, foreign ownership as a proxy for foreign direct investment has a positive impact on firm productivities. One of the most cited studies within this field by Aitken and Harrison (2001) looks at the effect of FDI on the productivity of Venezuelan plants. They find that

technology spillovers as well as spillovers of non-tangible assets have a positive effect on the productivity of domestic-foreign joint ventures. Their result is however only robust for small plants classified to have under 50 employees. They also find that an increase in foreign ownership has a negative impact on the productivity of fully domestically owned firms within the same industry. In the underlying theoretical model of Melitz (2003), these results would mean that not only would an increase in foreign equity increase firm productivity and implicitly increase the firm's export intensity, but also that the domestically owned plants which are adversely affected in terms of productivity may potentially exit the market. This will eventually lead to a higher industry average firm foreign equity as well as higher industry average firm productivity. Drawing on the conclusions of the above study, an increase in the industry-wide average firm foreign ownership is expected to have a positive effect on the industry average firm profits.

Comparably the estimations also make use of the government ownership variable and include it in the regression analysis. This variable has the same parameters ranging between 0-1 and is determined in the same way as foreign ownership. Many free market economists argue that government enterprises are less efficient than private enterprise due to the misalignment of incentives of its managers by the means of the principle agent problem. This means that politicians in charge of state owned institutions may pursue inefficient strategies aligned to their political goals such as excessive employment. However as previously noted, fully state owned enterprises are excluded from the survey hence the profit motive should remain strong amongst MEs. Vining and Boardman (1992) find that PEs are substantially better in terms of both productivity and profitability than both MEs and SOEs however they also find that MEs tend to perform better than SOEs. Due to these arguments, an increase in average firm government equity is expected to have a negative and significant effect on the average industry profits. [17]

The next control variable taken into consideration is the use of foreign inputs in production. This is recorded as the share of the overall inputs used in the production process being of a foreign origin. Similarly, firm specific data is used to convert the variable into the industry-wide average firm foreign inputs share calculated using the method of market share weighted averages. In line with Amiti and Konings (2007), foreign inputs share is expected to have a positive and significant effect on average industry profits foreign technology being embodied in the inputs producing productivity spillovers.

The sixth control variable used is the industry specific average firm skill intensity. The Enterprise Survey publishes firm-level data that not only specifies the total amount of full-time employees but also distinguishes between production and non-production workers. The production workers are further separated into skilled and unskilled labour. By definition skilled production workers possess expert job specific knowledge, a college degree or job specific technical qualifications (World Bank, 2015). Moreover the production workers are defined as the workers who are directly involved in the manufacturing process. With the aid of this information, industry firm specific skill intensity is determined by dividing the number of skilled production workers by the total number of full time workers and consequently calculate the industry specific average firm skill intensity using the market share weighted average method. The relationship between this variable and the industry average firm profits or productivity is open to question. Although skilled labour is in fact more productive than unskilled labour, skilled labour also demands higher wage compensation thus the overall effect on

[17] ME, PE and SOE are acronyms for mixed enterprise, private enterprise and state owned enterprise respectively.

productivity and profits is ambiguous. Emami Namini, Lopez, Facchini (2013) in their study of Chilean manufacturing plants show that exporters are generally more skill intensive than non- exporters. In line with Melitz (2003) they show that exporters have to endure additional fixed export entry costs, which means by firm selection, only the most productive plants choose to export. Due to the above findings, the industry specific average firm skill intensity is expected to have a positive significant effect on the average firm profits.

One of the main pillars of trade liberalisation literature includes the Heckscher-Ohlin model of trade. The main idea behind the model is that in the open economy setting, countries specialise in production of and export the goods which use the country's relatively abundant factor intensively in production and import the good which uses a relatively scarce factor intensively in production. In a two factor Heckscher-Ohlin model that considers labour and capital as factor inputs, trade liberalisation leads to the relatively abundant factor gaining and the relatively scarce factor losing from opening up to trade. However the key conclusion of the model is that the overall welfare increases. In light of the model's conclusions it is determined whether the countries under study are either relatively labour or capital abundant which then helps to identify the comparative advantage sectors that stand to gain proportionately more from opening up to trade. The comparative advantage sectors are defined as the sectors which on average use the relatively abundant factor more intensively in production relative to the country's average abundant factor intensity. For example if a country is relatively labour abundant, the sectors within that country that use labour more intensively in production relative to the country's average labour intensity are considered to be the comparative advantage sectors. A country's relative factor abundance is determined by comparing the GDP per capita of the countries under study with the weighted average GDP per capita of their 3 main trade partners. The GDP data is obtained from the World Bank database which publishes annual data of World Development Indicators. A country's main trade partners are defined as countries which receive the largest share of the source country's exports. To obtain this information the study makes use of the International Trade Centre data tools which summarise the United Nations Commercial Trade Database, concisely publishing import and export data for aggregated by countries and/or product groups. With the help of the destination country export values, the weighted average GDP per capita of their 3 main trade partners is determined using each trade partner's share in total country exports as weights. The theoretical reasoning behind the determination of country relative factor abundance makes use of the Cobb-Douglas production function and is summarised below:

(4.2)

$$GDP = Y = AL^{\alpha}K^{1-\alpha}$$

(4.3)

$$GDP_{per\ capita} = \frac{Y}{L} = A\left(\frac{K}{L}\right)^{1-\alpha}$$

(4.4)

$$\frac{Y}{L} < \frac{Y^*}{L^*} \Leftrightarrow \frac{K}{L} < \frac{K^*}{L^*}$$

The assumption is that the TFP parameter (A) and the input exponent (α) for a specific sector are equal across countries that trade with each other**.** The country with a lower GDP per capita than the

weighted average GDP per capita of its three main trade partners is considered to be labour abundant. As shown above, GDP per capita is determined by a dividing the output by the total amount of labour. Then it can be shown that a country with a lower GDP per capita has a lower capital to labour ratio. By this relationship, it can be concluded that countries with relatively lower GDP per capita thus lower capital to labour ratios, are in fact the labour abundant countries and countries with relatively higher GDP per capita thus higher capital to labour ratio are the capital abundant countries. To reiterate, Heckscher-Ohlin theory suggests that countries which are abundant in a certain factor, specialise in production of goods that use that factor intensively in production. Moreover it can be concluded that countries that are relatively abundant in labour have a comparative advantage in producing labour intensive goods, and hence in line with the Heckscher-Ohlin theoretical predictions, the relatively more labour intensive sectors within that economy should benefit the most from trade liberalisation. Similarly, capital abundant countries will specialise and export relatively more capital intensive goods and thus the relatively more capital intensive firms within an economy should benefit the most from trade liberalisation.

In order to determine the labour intensity of each sector, the labour costs are divided by the total sales for each individual firm to calculate firm specific labour intensity. Subsequently, with the method of market share weighted averages, the industry wide average labour intensity is calculated. The calculation is repeated for every sector in a given country and then the average labour intensity is determined for a country as a whole. If a sector's average labour intensity is higher than the average country wide average labour intensity, then that sector is considered to be the labour intensive sector. Similarly if a sector has a lower average labour intensity than the country wide average labour intensity, then that sector is considered to be capital intensive. Given the industry wide and country wide labour intensities, a dummy variable is constructed which distinguishes between the comparative advantage and the comparative disadvantage sectors. The analyses follows Heckscher-Ohlin conclusion of the sector specific welfare benefits. If a country is for example labour abundant relative to its trade partners, the sectors whose average labour intensity is higher than the average country wide labour intensity, then those sectors take the value of 1 as they are the comparative advantage sectors. However if the sector average labour intensity is lower than the country wide labour intensity then these sectors are the comparative disadvantage sectors and take the value of zero. The analysis for the capital abundant countries follows the same line of reasoning. The following points explain the dummy variable distribution in a more concise manner: [18]

1) Labour intensive sector in a labour abundant country = 1 (CA sector)
2) Labour intensive sector in a capital abundant country = 0 (CD sector)
3) Capital intensive sector in a labour abundant country = 0 (CD sector)
4) Capital intensive sector in a capital abundant country = 1 (CA sector)

When comparing GDP per capita of the countries under investigation with the export share weighted average GDP per capita of their main trading partners, it is found that all Eastern European and Central Asian countries in the sample have a lower GDP per capita that than their respective trade partners weighted average. The reason for this is that the Eastern European and Central Asian countries' main trade partners are predominantly more developed Western European economies. This also suggests

[18] CA will for the rest of the paper refer to Comparative Advantage and CD will refer to Comparative Disadvantage

that all countries under study are in fact relatively labour abundant, and thus according to the Heckscher-Ohlin theory, these countries should all specialise in the production of and export labour intensive goods. In theory, trade liberalisation should benefit relatively labour intensive firms in these countries as exposure to trade gives them the comparative advantage in the production of their goods.

As previously mentioned, with regards to the empirical test, the EMU entry as well as a ceteris paribus increase in industry average export intensity is considered to be indicative of a trade liberalisation process. In order to test whether the comparative advantage sectors benefit proportionately more from trade liberalisation in terms of profits, interaction terms between the CA sector dummy variable and a trade liberalisation indicative variables are constructed. In line with the Heckscher-Ohlin theory, trade liberalisation is expected to have a proportionately more positive effect on profits for the comparative advantage sectors therefore, the coefficient of the interaction term is expected to be positive and significant. The sign and significance of the isolated CA sector dummy is a bit less clear cut. There is no theoretical reasoning for either the CA or CD sector to be consistently more profitable prior to trade liberalisation. Industry average profits for each type of sector depends on several factors which include varying factor productivities, level of direct competition in the industry, and the nature of product differentiation within the industry. Each of these factors has a direct effect on a firm's demand or cost function which implicitly impacts firm profits.

Firstly if the productivity of labour is lower compared to other factors such as capital, then the relatively labour intensive sectors will have higher costs and in effect be less profitable. Secondly, profitability also depends on the level of competition in the industry. In the Melitz setting with free entry, the larger the fixed costs the smaller the number of firms present in the market. This also means each firm sales has to be larger to cover those fixed costs. If one predicts that capital intensive firms have higher fixed costs due to for example high costs of machinery then the CD sectors in the sample will have less firms per industry thus be structurally less competitive. This should in effect increase the industry average profits of CD sectors. Thirdly if the goods sold by relatively labour intensive industries are more homogenous, then each single firm has less market power with respect to the goods market thus the mark-up over marginal costs is smaller in these industries. The corresponding industry structure is thus not monopolistic but oligopolistic competition. The above arguments can all contribute to the prediction that CA sectors are structurally less competitive and therefore one can expect the CA sector dummy variable to have a negative, significant effect on industry average profits.

4.1 Descriptive Statistics

After sorting the data set and prior to commencing the empirical analysis, one can describe the variables with a table of descriptive statistics that allows us to see some interesting data characteristics. Descriptive tables are included for both, the full firm level dataset as well as the industry specific average firm variables. As described previously firm specific data is used to construct the industry wide average firm variables in order to test the model's hypothesis. The full sample includes an unbalanced panel of 21271 firms which is then used to calculate the variables' weighted averages within 29 countries and 191 industries. Following the weighted average calculations, this leaves 3773 industry, country and year specific average firm observations.

Table 4.1: Descriptive Statistics for the full firm level dataset

Variable	*Mean*	*Median*	*Maximum*	*Minimum*	*Std. Dev.*	*Observations*
Sales ($)	136000000	601865.5	2.46E+12	0.556793	16900000000	21271
Labour costs ($)	782502.6	56313.15	1730000000	0	13954096	21271
Profit ($)	14099532	107767.4	79100000000	-607000000	943000000	18814
Sales per labour ($)	2825972	27227.24	49100000000	0.01856	341000000	21210
Export intensity	0.106745	0	1	0	0.255786	21271
Exports ($)	62225686	0	1.23E+12	0	8430000000	21271
Firm age	15.2696	13	182	0	13.70816	20601
Firm size	92.71457	20	20843	1	392.0448	21210
Foreign Equity	0.059653	0	1	0	0.218221	21041
Government Equity	0.017612	0	1	0	0.1133	21041
Skill Intensity	0.577831	0.6	1	0	0.249131	11529
Foreign inputs	0.301795	0.1	1	0	0.362358	11264

Table 4.2: Descriptive Statistics for the industry weighted average variables

Variable	*Mean*	*Median*	*Maximum*	*Minimum*	*Std. Dev.*	*Observations*
Sales ($)	81064643	2589167	79100000000	122.57	2040000000	3773
Labour costs ($)	212000000	1886387	45300000000	20	1970000000	3773
Profit ($)	60166705	477354.5	79100000000	-370000000	2030000000	3625
Sales per labour ($)	606853.8	40022.95	360000000	4.045103	11942513	3773
Export intensity	0.24178	0.095676	1	0	0.300971	3773
Exports ($)	26691147	136372.9	27700000000	0	713000000	3773
Firm age	20.607	15.967	168.322	1	17.34	3769
Firm size	218.6254	80	17328.04	2	638.8336	3773
Foreign Equity	0.111771	0	1	0	0.243828	3755
Government Equity	0.028754	0	0.99	0	0.126899	3755
Skill Intensity	0.547259	0.576995	1	0	0.211524	2163
Foreign inputs	0.366889	0.298141	1	0	0.329128	2118
CA	0.415082	0	1	0	0.492898	3773
EMU	0.045246	0	1	0	0.207911	3773

The summary statistics table 4.1 describes the mean, median, maximum, minimum, standard deviation as well as the number of observations for variables that include the dollar denominated sales, labour costs, profits, sales per unit of labour, exports, export intensity, firm age, firm size, foreign equity, government equity, skill intensity, foreign inputs, the comparative advantage sector dummy and the European Monetary Union dummy. The average firm sales are equal to $136 million dollars with a maximum of $2.46 trillion for a firm in Poland. The average profits earned by all firms in the sample is approximately $14.1 million. However when taking sales shares industry weighted average into account, the industry average firm profits are roughly $60.1 million. The industries with the highest average profits across all countries are the 'Manufacture of Wines' and the 'Jewellery and Related Articles' whereas the least profitable is the industry involved in 'Dressing and dyeing of fur; manufacture of articles of fur'. One can recognize that the least profitable industry sells a relatively homogenous product where as the most profitable industries are characterized by product heterogeneity.

Due to the fact the weighted averages are calculated using sales shares as weights, firms with larger sales revenues consequently have a larger weight in the calculation unlike the full firm level data which gives each firm an equal share. The difference between the two summary descriptive statistics tables will to an extent allow one to infer the characteristic nature of firms with higher market shares. For example one can see that the industry average firm export intensity mean is 0.2418 as opposed to the raw firm data which has a mean of 0.1067. Given the nature of the weighted average firm characteristics, this suggests that firms with larger sales revenues on average have a higher export intensity. This potentially implies that a decision to export may in fact be more common for firms with a higher ex-ante sales market share which in the Melitz setting are the most productive firms. Out of the 29 countries investigated, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Macedonia, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia and Turkey had an above average export intensity. Given these countries are all either EU member countries or a direct neighbour to an EU member country it indicates that they are in fact the most open economics. The countries with the highest average industry export intensity are Slovenia and Estonia with the average export intensities of 0.528 and 0.492 respectively. Both of these countries joined the European Monetary Union during the time period analysed which serves as first evidence to support the hypothesis that countries within the EMU have the highest exposure to foreign markets thus operating within the so called 'Single Market' does in fact mean being more internationally competitive. Although it does not explain whether EMU was the primary cause of the relatively high export intensity, this will be tested empirically using regression analysis in the following section. Moreover this begs the question of endogeneity, whether these countries had higher export intensity ex-ante and as a result joined the EMU, or whether the export intensity increased as a result of joining the EMU. The industry wide average firm exports mean is $26.7 million and the maximum industry wide average firm exports is $27.7 billion which also corresponds to the most profitable sector specified above. The countries with the highest export values are Uzbekistan and Russia whereas the countries with the smallest export values are Armenia and Kosovo which can be explained by the countries' relative size.

The average firm age is approximately 15.3 years as opposed to 20.6 years for the industry wide weighted average firm age. This implies that firms with higher market shares are on average older than firms with lower market shares which can be explained by both, the fact that older firms have had a longer time to expand their customer base but also by the first mover advantage. The country with the most mature firms is Serbia with the industry average firm age mean of 33.1 years old closely

followed by Slovenia whose mean is 29.7 years old. The industry average firm size mean is 218.6 with a relatively large standard deviation of 638.8 employees. This shows that industries vary widely in terms of the amount of labour they employ, which may be down to differing industry labour intensities but may also depend on the competitive structure of various industries. Industries which have high fixed costs, theoretically and in reality tend to be present in less competitive markets thus having smaller amount of direct competitor firms each being bigger in size in terms of the amount of labour they employ. This is because since fixed costs are sunk, they have to produce in large quantities in order to move down the average cost curves.

The industry wide mean foreign equity share is 11.1% and the industry wide foreign inputs mean is 36.7%. This shows that firms in the Eastern European and Central Asian region are in fact heavily linked and influenced by foreign economies, meaning these will be important determinants of average firm profits. Foreign equity as a proxy for FDI is the highest for industries in Latvia and Estonia. The industry wide average firm government equity mean is only 2.88%. Given the fact that now it can be seen that the government plays only a small role in the running of domestic enterprises, this shows that following their transition from socialism, the Eastern European and Central Asian economies have undertaken a rapid privatisation process. Government equity is on average the most present in industries of Belarus and Uzbekistan. In terms of the industries where governments have the most influence, industries within the ISIC 4 digit codes corresponding 'Manufacture of railway and tramway locomotives and rolling stock' and 'Manufacture of refined petroleum products' seem to have the highest government ownership share.

The industry wide skill intensity mean is 0.547 with a fairly small standard deviation of 0.211. This shows that industries do not substantially vary with respect to the type of labour they employ. As previously mentioned, the choice of employing skilled or unskilled labour depends on the productivity-wage trade off. Although skilled labour is more productive than unskilled labour, they demand a higher wage compensation, therefore the choice for the employer is ambiguous. This can also be influenced by the labour market laws and whether the minimum wage is below or above the equilibrium wage within the country in question.

5. Empirical model

5.1 Methodology

In order to empirically test the outlined hypothesis derived from the theoretical model of Melitz (2003), the study makes use of a panel firm level data described in the previous section. Namely the thesis aims to test whether a trade liberalisation process does in fact lead to a higher industry average firm productivity and industry average export intensity through the mechanism of intra-industry resource and profit reallocations. As explained in theoretical model section, average industry profits have a direct positive relationship with the industry average productivity parameter. This is shown by looking at the first derivative of the profit function with respect to the above mentioned average productivity parameter. The positive sign of the derivative indicates an undisputed positive relationship thus justifying the choice of empirical model. Another core conclusion of the model is that as a result of opening up to trade, the industry average export intensity will increase. By assumption, prior to trade liberalisation, only the most productive firms are able to export due to the iceberg transport costs and the additional fixed production costs associated with exporting. Following trade liberalisation, the intra-intra-industry resource reallocation mechanism from the least to the most

productive firms is triggered and as a result, the average firm is not only more productive but also on average more involved in exporting. In order to test this hypothesis, the following model is estimated:

(5.1) $$Exp\_Int_{ijt} = \alpha + \beta_1 EMU_{ijt} + \beta X'_{ijt} + \delta_i + \delta_j + \delta_t + \varepsilon_{ijt}$$

Where Exp_Int_{ijt} refers to the industry average export intensity for firms within industry (*i)*, country (*j*) and time (*t*). The variable of interest is EMU_{ijt} which describes the European Monetary Union dummy in the same industry (*i)*, country (*j*) and time (*t*). The variable represents a process of trade liberalisation and thus the variable's coefficient β_1 is expected to be positive and significant, signalling that entering the EMU through the mechanism of resource reallocation leads to a higher industry average export intensity. X'_{ijt} represents a vector of control variables included in the model which includes the industry average firm age, firm size, foreign equity, foreign inputs, skill intensity and government equity. From an econometric perspective ε_{ijt} is assumed to be independent and identically distributed over industries countries and time, with zero mean and variance σ_ε^2. Model (5.1) consists of a different industry specific, country specific and time specific intercepts treated as N fixed unknown parameters. The assumptions outlined are consistent with the standard fixed effects model approach as described in (Verbeek, 2008). Given the fact that firm level data was used to calculate the industry average firm variables, the procedure removed any structural differences amongst firms thus it is not necessary to include firm specific fixed effects as well. An alternative panel data model is a random effects model which treats the industry, country and time specific intercepts as random. However (Verbeek, 2008) states that "if observations in the sample are one of a kind, they cannot be viewed as a random draw from the underlying population". This means that, when the investigation is industry, country and time specific, the fixed effects interpretation is the most appropriate given we want to make inferences and predictions for particular countries and industries. To summarise, the fixed effects model is preferred when the specific identification of different variables is important which in the case of this estimation it is. Moreover the fixed effects estimation in its procedure essentially eliminates any problems brought about by the correlation between the individual effects and the explanatory variables. Nevertheless the choice of the appropriate model can be tested using the Hausman test which tests whether the fixed effects estimator and random effects estimator are significantly different, the null hypothesis being that they do not significantly differ. A reason for the estimators to be different may be a presence of correlation between the intercept and the variables, however other misspecification problems may give rise to the rejection of null hypothesis. However in any case of the following estimations, fixed effects model is the preferred model. Due to this and the above mentioned arguments, the regression analysis will apply the fixed effects in all forthcoming specifications. Moreover, model 5.1. helps one determine what drives firms to export in the first place and what characteristics firms possess that induce them to penetrate foreign markets and increase their export intensity. This test will also serve as a robustness check for the control variables used in the forthcoming model specifications.

The second and third empirical models will test the core conclusions of the underlying theoretical model, investigating the impact of trade liberalisation on the average firm productivity through testing its effect on the industry average firm profitability. The trade liberalisation process is modelled by two different parameters. Firstly the variable of interest is the industry average export intensity. A ceteris paribus increase in the industry average export intensity is a strong indication of a country opening up

to trade, given that firms do so as result of an increased exposure to international markets. The model estimated is specified in the following way:

(5.2) $$\pi_{ijt} = \alpha + \beta_1 Exp\_Int_{ijt} + \beta X'_{ijt} + \delta_i + \delta_j + \delta_t + \varepsilon_{ijt}$$

where π_{ijt} refers to the industry average firm profits for firms within the industry (*i)*, country (*j*) and time (*t*). Exp_Int_{ijt} represents the industry average export intensity for industry (*i)*, country (*j*) and time (*t*) and X'_{ijt} represents a vector of control variables including the industry average firm age, firm size, foreign equity, foreign inputs, skill intensity and government equity. Given the line of reasoning for the connection between export intensity and trade liberalisation and in accordance with the mechanism outlined in the Melitz model, the coefficient of the industry export intensity is expected to be positive and significant. The model takes the form of fixed effects estimation using δ_i, δ_j and δ_t as dummies to control for industry fixed effects specified by the ISIC industry codes, country fixed effects and time fixed effects.

In the third model the variable of interest is the EMU dummy which for several previously mentioned reasons is argued to represent a trade liberalising process. The model is specified in the following way:

(5.3) $$\pi_{ijt} = \alpha + \beta_1 EMU_{ijt} + \beta X'_{ijt} + \delta_i + \delta_j + \delta_t + \varepsilon_{ijt}$$

where π_{ijt} refers to the industry average firm profits for firms within the industry (*i)*, country (*j*) and time (*t*), EMU_{ijt} represents the industry average export intensity for the same industry (*i)*, country (*j*) and time (*t*) and X'_{ijt} represents a same vector of control variables explained above. Adopting a common currency with its trade partners should eliminate certain barriers to trade, stimulating competition amongst members of the Eurozone. The competitive forces should then trigger intra-industry resource and profit reallocation from the least to the most productive firms thereby increasing the industry average firm productivity as well as the industry average firm profits. Consequently in this hypothesis, the EMU dummy is expected to have a positive and significant coefficient. Model (5.3) is also used to test the underlying model's conclusions as well as serving as a robustness check for the model (5.2). With the same expected signs of export intensity and EMU which are the coefficients of interest, complementing results would validate the justification of considering EMU as a process of trade liberalisation. Similarly the model is specified using industry, country and time fixed effects.

Next, a model is developed to incorporate the comparative advantage sector dummy into the analysis. In the previous section it is argued that according to the Heckscher-Ohlin model of trade, countries specialise in the production of goods and subsequently export the goods which use the relatively abundant factor intensely in production. As a result of trade liberalisation, the demand for goods predominantly produced with the relatively abundant factor rises proportionately more. Consequently the industries which use the abundant factor the most intensively in production should stand to gain the most and hence the industry average firm profits should increase relatively more in comparison to the sectors using the scarce factor intensively in production. The construction of the CA dummy is explained in section 4 in more detail. In line with the conclusions of the Heckscher-Ohlin model in association with the Melitz (2003) theoretical model, the CA dummy is incorporated to test whether the comparative advantage sectors are more or less profitable in general as well as if they gain proportionately more in terms of profitability as a result of trade liberalisation. The model is specified in the following way:

(5.4) $$\pi_{ijt} = \alpha + \beta_1 Exp\_Int_{ijt} + \beta_2 CA_{ijt} + \beta_1 Exp\_Int_{ijt} * CA_{ijt} + \beta X'_{ijt} + \delta_j + \delta_t + \varepsilon_{ijt}$$

where π_{ijt} refers to the industry average firm profits for firms within the industry (*i)*, country (*j*) and time (*t*), Exp_Int_{ijt} represents the industry average export intensity for the same industry (*i)*, country (*j*) and time (*t*), CA_{ijt} is the comparative advantage dummy specific to industry (*i)*, country (*j*) and time (*t*), $Exp\_Int_{ijt} * CA_{ijt}$ is the interaction term between industry average firm export intensity and the comparative advantage dummy and X'_{ijt} represents a vector of control variables. Using the same line of reasoning the coefficient of the export intensity variable is expected to be positive and significant signalling a positive effect of trade liberalisation on the industry average firm profits. Secondly, an ambiguous relationship is expected between the comparative advantage dummy and industry average firm profits. This is because industry profits are determined by the demand and the cost functions of each respective industry and these are in theory arbitrary for each type of industry. The interaction term is expected to be positive and significant as this is where the Heckscher–Ohlin model conclusions are expected to reinforce and intensify the relationship between trade liberalisation and industry average profits. If trade liberalisation does in fact increase average firm profits as propagated by Melitz (2003), then according to the H-O model this relationship should be even more intense for the comparative advantage sectors within the liberalising economies. The model once again takes the form of the fixed effects method, using country and time fixed effects dummies. As opposed to the previous models, this specification excludes industry specific dummy because the industry fixed effects are controlled for by the CA dummy and its interaction term.

The fifth empirical specifications incorporates the same methodology as model (5.4) however it uses EMU to model the process of trade liberalisation and serves as a robustness check. The model take the following form:

(5.5) $$\pi_{ijt} = \alpha + \beta_1 EMU_{jt} + \beta_2 CA_{ijt} + \beta_3 EMU_{jt} * CA_{ijt} + \beta X'_{ijt} + \delta_j + \delta_t + \varepsilon_{ijt}$$

where π_{ijt} refers to the industry average firm profits for firms within the industry (*i)*, country (*j*) and time (*t*), EMU_{ijt} represents the European Monetary Union dummy for the same country (*j*) and time (*t*), CA_{ijt} is the comparative advantage dummy specific to industry (*i)*, country (*j*) and time (*t*), $Exp\_Int_{ijt} * CA_{ijt}$ is the interaction term between the EMU dummy and the comparative advantage dummy and X'_{ijt} represents a vector of control variables. Once again, the fixed effects approach with country and time specific dummies and the CA sector dummy to control for industry fixed effects. In line with the explanations of the previous model, the coefficient β_1 is expected to be positive and significant indicating that entering the EMU will lead to higher industry average firm profits through intra-intra-industry resource reallocations. The sign and significance of β_2 coefficient is ambiguous as this is subject to the profit function of each specific industry and there is no theoretical reasoning for industries using a certain factor intensively to be structurally more competitive. Moreover the interaction term is expected to have a positive and significant coefficient β_3 implying that as countries join the EMU, the comparative advantage sectors should gain proportionately more in terms of profits and productivity since these sectors face higher international demand.

In the following section, the empirical results obtained using the above methodology are explained, clearly specifying whether the null hypotheses have been rejected.

5.2 Results

5.2.1 The effect of EMU on the industry average export intensity

Using the unbalanced panel of industry average variables and the fixed effects approach explained above, the first model studies the effect of EMU on the industry average export intensity. Theoretically, there should be a strong correlation between the two variables as in practice, EMU should facilitate more intra-European trade thus increasing industry average export intensity. The results of the first model displayed in table 5.1 yields an interesting set of results as it also explains the nature of firms involved in exporting which are mostly in line with the hypothesised signs and significance. Looking at the EMU dummy, one can see that the coefficient is consistently positive regardless of the control variables added however it is insignificant in all specifications. This may be due to the fact that the study considers countries that only entered the EMU towards the latter stages of the years examined, which means the effect of adopting a common currency is yet to materialise and be reflected in the data. On the demand side, this may be due to the fact that foreign consumers are not immediately aware of the entrant country products, meaning price transparency is only a benefit once consumers accrue enough information to demand the goods. Moreover on the supply side, the process of entering foreign markets and creating an exporting distribution channel within the companies may take significant amount of time. Although, firms now face lower costs of exporting due to elimination of transaction costs inducing them to export or increase their export intensity, penetrating foreign markets is not an immediate step as accumulating market knowhow and establishing export distribution channel is a gradual process. However it is also plausible that entering the EMU may not have played such an important role in liberalising trade. Many countries in the sample are in the EU common market and may have already reaped all the benefits from that institutional setting. In addition it can also be argued that the additional trade benefits EMU brings to Eastern European countries is negligible given how integrated the economies are within the EU already. Given the lack of evidence, one cannot reject the null hypothesis that effect of entering EMU on the industry average export intensity is insignificantly different from zero.[19]

The second variable incorporated into the model is the logarithm of total sales per labour which serves as a proxy for industry average labour productivity. The theoretical model of Melitz (2003) by construction shows that exporters are ex-ante more productive and thus self-select themselves to export rather than increase their productivity by the learning effects. The theoretical set up suggests that firms only begin exporting if their marginal costs are low enough to cope with the additional costs associated with exporting and can still make positive profits. Inspecting the table thoroughly, one can see that the coefficient is consistently positive but only significant at a 10% significance level in the first five of seven specifications it is included in. This produces fairly good evidence to support the assumption that exporters are on average more productive than their non-exporting counterparts. This result is also in line with the conclusions of Wagner (2007) who determines that after ten years of research looking at the exporting and productivity relationship, exporters are significantly more productive than non-exporters and exporters self-select themselves into export markets, while exporting does not necessarily produce much within firm productivity improvements.

[19] H_0: Trade liberalization by the means of entering the European Monetary Union, has no effect on the industry average export intensity.

Table 5.1: Regression results for the effect of EMU on the industry average export intensity

VARIABLE	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*	*Model 7*	*Model 8*
Constant	0.1583*** (0.0037)	0.1154*** (0.0234)	0.0910*** (0.0299)	0.0918*** (0.0289)	0.0754*** (0.0286)	0.0753*** (0.0287)	0.0751 (0.0528)	0.0282 (0.0565)
EMU	0.0228 (0.0313)	0.0144 (0.0316)	0.0135 (0.0316)	0.0139 (0.0316)	0.0075 (0.0311)	0.0075 (0.0311)	0.0066 (0.0578)	0.0081 (0.0584)
Sales per Labour		0.0042* (0.0022)	0.0041* (0.0022)	0.0040* (0.0022)	0.0037* (0.0022)	0.0037* (0.0022)	0.0035 (0.0038)	0.0024 (0.0038)
Firm Age			0.0092 (0.0065)	0.0078 (0.0065)	0.0109* (0.0064)	0.0108* (0.0064)	0.0272** (0.0108)	0.0336*** (0.0128)
Firm Size				0.00002*** (0.000007)	0.00001** (0.000007)	0.00001** (0.000007)	0.00002** (0.00001)	0.00002** (0.00001)
Foreign eq.					0.2135*** (0.0247)	0.2136*** (0.0248)	0.2432*** (0.0311)	0.2286*** (0.0315)
Government eq.						0.0014 (0.0460)	-0.0103 (0.0580)	-0.0111 (0.0598)
Skill Intensity							0..0045 (0.0357)	0.0235 (0.0361)
Foreign Inputs								0.0777*** (0.0268)
Observations	3773	3769	3769	3769	3755	3755	2163	2118
Adjusted R^2	0.4522	0.4530	0.4533	0.4548	0.4717	0.4741	0.4240	0.4365

Dependent Variable: Industry Average Export Intensity
Independent Variables: EMU dummy, Logarithm of Sales per Labour, Logarithm of Firm Age, Firm Size, Foreign Equity share, Government Equity share, Skill Intensity and Foreign Inputs Share
The standard error is in parentheses; * significant at 10%, ** significant at 5%, *** significant at 1%; All variables are calculated as their respective industry weighted averages as described.
Method Used: Panel Least Squares, with country, industry and time fixed effects.

The third included is the logarithm of firm age. Its coefficient is consistently positive and its significance grows as more control variables are added. In the full model, firm age is positive and significant at a 1% significance level implying that exporting firms are on average older which may be explained by several factors. First of all, given exporting firms have to be more productive ex ante, older firms have more time to employ and retain the most productive labour and have had more time to accumulate both domestic and foreign market knowhow therefore are in a better position to penetrate foreign markets. Start-up firms usually focus on the domestic market and over time if they are successful then make the decision to try to replicate their business model in the foreign markets. This finding is in line with the results of Farinas and Marcos (2007) who find that Spanish firms that export are on average 10 years older than non-exporters. The next variable incorporated into the model is industry average firm size which is positive and significant at a 5% significance level across all specifications. This unanimously shows that firms with a higher export intensity are on average larger in size which is also in line with the results of Farinas and Marcos (2007). Moreover in the Melitz model, following trade liberalisation labour is reallocated to the more productive exporting firms which makes them structurally larger. Following transition from socialism, Eastern European countries have entered several free trade agreements which by the model's mechanism, over time made exporters larger in size.

The fifth variable included is the foreign equity share which is often used as a proxy for FDI. Looking at the table, the variable's coefficient is positive and significant at a 1% level in all specifications therefore there is robust evidence to conclude that firms with higher foreign ownership share have on average a higher export intensity. Moreover the magnitude of the coefficient is relatively large, meaning it is one of the most important determinants of export activity. Greenway and Kneller (2005) propose that FDI and exports are substitute channels for firms globalising. They also suggest that foreign investors often acquire equity of domestic firms with an ex- ante aim of exporting the firm goods to the investor's respective home market and that this is especially the case for vertical FDI. The findings can therefore be explained by the better foreign networks that firms with a higher foreign ownership possess, which makes them on average export a larger portion of their output. The next variable included is the government equity share which is shown to have conflicting signs in various specifications but nevertheless consistently insignificant. Given the government's priorities, state-private owned enterprises tend to be more involved in the production of public goods to serve the needs of the country's citizens therefore the coefficient is expected to have a negative and significant coefficient. The results however are conflicting with a positive and negatives signs, however consistently significant which suggests government equity has no effect on the export shares.

Seventh variable included is skill intensity and its coefficient is slightly positive but insignificantly different from zero. One can thus conclude that skill intensity has no influence on the industry average firm's export intensity. This result is not in line with the findings of Emami Namini, Lopez, Facchini (2013), who find that exporting Chilean plants are on average more skill intensive. Exporter skill intensity can also be explained by the Heckscher-Ohlin hypothesis, which explains countries export goods that use the relatively abundant factor intensively in production. The results therefore suggest that Eastern European and Central Asian countries are not abundant in skilled labour. The last variable included is the foreign inputs share used in production. Its coefficient is positive and significant at a 1 % significance level. This can also be explained by the fact that firms that import foreign inputs also have a better existing foreign network which makes them more likely to export to those markets. Moreover firms that use foreign inputs may also be more likely to produce goods that are more

compatible with the goods demanded by the foreign consumers. This result may also be partially explained by the reasoning of Greenway and Kneller (2005) who state that firms who receive vertical FDI on average export more. Vertical FDI aims to break up the supply chain in order to make the production process most efficient and therefore firms import foreign inputs in order to complete their phase of the supply chain and export their goods abroad.

5.2.2 The effect of trade liberalisation on industry average profits

The second model considers the effect of trade liberalization using industry average export intensity as an indicator of trade liberalizing process, on the industry wide average firm productivity proxied by industry average firm profits. The methodology explained in the previous section is applied to a panel least square regression analysis and yields interesting results that both validate and contradict the hypotheses and expectations outlined. Export intensity is the variable of interest, as a ceteris paribus increase in export intensity is a clear indication of a trade liberalizing process taking place. The model is used to test the specific hypotheses concerning the nature of all active firms in the market prior to and after trade liberalization takes place. Through analysing table 5.2, we can see that export intensity is positive and significant at a 1% significance level across all seven specifications. This unanimously confirms the model's prediction that trade liberalization through a ceteris paribus increase in the industry average export intensity leads to a higher industry average firm profitability and productivity.

The magnitude of the coefficient is the largest in the specification without any control variables and gradually diminishes as these variables are added to the model. In the specification with all the control variables including industry wide firm age, size, foreign equity, government equity, skill intensity and foreign inputs share, the coefficient on the export intensity variable is 0.9665. This implies that a 10% increase in the export intensity is on average associated with a 9.7% increase in the industry average firm profits. In terms of the model's explanatory power, the specification including all control variables has an R^2 of 0.5909 which suggests a fairly strong relationship between the model and the response variables.[20] The positive and highly significant results of all the specifications proves that the intra-industry resource reallocation mechanism plays an important role in improving the intra-industry wide average firm productivity.

To reiterate the theoretical hypothesis, eliminating barriers to trade substantially impacts the productivity cut-off point due to increased competition in both the factor market and goods markets. This shift thus forces the least productive firms to exit the market and the most productive firms to employ the displaced factors, leaving a more efficient and profitable pool of firms within a given industry. Although trade liberalization may also to an extent trigger within firm productivity increase through knowledge spillovers associated to operating in the foreign markets, the consistently positive and significant coefficient of large magnitude on export intensity proves that industry average productivity increase does at least partially stem from intra-industry resource reallocation mechanism. Overall the results in the table provide strong evidence for one to reject the null

[20]Given the nature of the variable being in the range of (0,1), a 10% increase in export intensity corresponds to the variable increasing by 0.1.
In a log-linear model the calculation of the percentage change of the dependent variables takes the form of $\%\Delta Y = \exp(\Delta X * \beta_i) - 1$; however with small value of the exponent the change can be interpreted by the coefficient itself as $\exp(\Delta X * \beta_i) \approx 1 + \Delta X * \beta_i$.

Table 5.2: Regression results for the effect of trade liberalisation on industry average profits

Variable	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*	*Model 7*
Constant	13.803*** (0.0519)	12.3178*** (0.2087)	12.3904*** (0.2025)	12.3482*** (0.2031)	12.3641*** (0.2032)	11.9087*** (0.3240)	11.1016*** (0.3690)
Export int.	1.4182*** (0.2454)	1.2910*** (0.2427)	1.1691*** (0.2351)	1.0254*** (0.2378)	1.0260*** (0.2376)	1.0979*** (0.2788)	0.9665*** (0.2844)
Firm Age		0.5582*** (0.0761)	0.4752*** (0.0741)	0.4800*** (0.0741)	0.4682*** (0.0744)	0.4392*** (0.0992)	0.6062*** (0.1117)
Firm Size			0.0008*** (0.00007)	0.0008*** (0.00007)	0.0008*** (0.00007)	0.0008*** (0.0001)	0.0008*** (0.0001)
Foreign eq.				0.9414*** (0.2737)	0.9814*** (0.2746)	1.0375*** (0.2800)	1.0223*** (0.2831)
Government eq.					0.8711* (0.5119)	0.2547 (0.5119)	0.1139 (0.5210)
Skill intensity						0.1491 (0.3143)	0.2530 (0.3154)
Foreign inputs							0.7786*** (0.2346)
Observations	3625	3625	3622	3611	3611	2081	2045
Adjusted R^2	0.4163	0.4318	0.4680	0.4719	0.4724	0.5880	0.5951

Dependent Variable: Logarithm of Industry Average Profit
Independent Variables: Industry Average Export Intensity, Logarithm of Industry Average Firm Age, Firm Size, Foreign Equity share, Government Equity share, Skill Intensity, Foreign Inputs Share
The standard error is in parentheses; * significant at 10%, ** significant at 5%, *** significant at 1%; All variables are calculated as their respective industry weighted averages as described.
Method Used: Panel Least Squares, with country, industry and time fixed effects.

hypothesis and conclude that trade liberalization does in fact lead to a higher industry average firm productivity.[21]

One can now further examine the results and see whether the control variables have the expected sign and significance as predicted in the previous sections. First control variable included is the logarithm of industry average firm age. For all specifications where the variable is included, the coefficient is positive and significant at a 1% significance level which is in line with the expectations. One can also see that adding firm age in the second model increases the R^2 from 0.4163 to 0.4318 suggesting that firm age is an important variable to include in the model, helping to explain where industry average profitability stems from. As argued by Jensen et al. (2001), experienced firms have had more time to implement the most efficient and thus the most profitable business models tailored to their specific target market. Moreover through the learning by doing effect, older firms are more able to undertake profitable investments to achieve economies of scale as well as having more time to recruit and retain the most productive workforce. In addition, younger firms have had less time to fully benefit from their marketing strategies as building a solid customer base can only be achieved in the long run.

Second control variable included in the model is the industry average firm size which is measure by each firm's labour count and averaged for the industry using sales shares weighted average method. Inspecting the results, one can see that the coefficient is positive and significant at a 1% significance level across all specifications where the variable is included. As well as the results being robust, adding industry average size in the model increases the model's explanatory power seen by the increase of R^2 from 0.4318 to 0.4680. This suggests that industry average firm size is an important variable to include in the model as it can be unanimously concluded, that an increase in the industry average firm size increases the industry average firm profits. The positive results are in line with the expectations and the prediction of Melitz (2003), which explains that trade liberalization will lead to reallocation of resources including labour from the least productive to the most productive firms. This mechanism makes the most productive firms systematically larger in size as they are in a better position to employ more labour in a competitive factor market. According to the model, trade liberalization will not only lead to the industry average firm size being larger but also the most productive firms within that industry being relatively larger. Given the robust results, this prediction is validated by the above model. Moreover by simply taking the overall industry average firm size prior to and after joining the EMU, it is found that for countries involved in this trade liberalising process, the average firm size increases from 151 workers per firm to 155 workers. Thirdly, the foreign equity variable is included in the model which represents the industry average foreign ownership within all active plants. Similarly, by analysing the results in the table one can see that the variable's coefficient is positive and significant at a 1% level across all specifications. Moreover the magnitude of the coefficient is relatively large and increases as more control variables are added, suggesting a strong effect of foreign equity on the industry average profits. Adding the variable to the model only improves the explanatory power of the model to a small extent as the R^2 increases from 0.4680 to 0.4719. However given the robust positive results it shows that foreign equity is an important variable to include in the model. The results seen in the table validate the expectations and are in line with the results seen in Aitken and Harrison

[21] H_0: Trade liberalization by the means of a ceteris paribus increase in export intensity, has no effect on the industry average firm profits.

(2001). The authors find that through mechanism of technology spillovers as well as spillovers of non-tangible assets, an increase in firm foreign equity leads to a higher firm productivity. However they also find that this has an indirect negative effect on plants within the same industry which are fully domestically owned. However given the fact that the industry wide average firm foreign equity is examined, any firm specific structural effects are eliminated thus the expectations suggest a positive relationship between industry average foreign equity and the industry average productivity.

The fourth control variable included is the industry average government equity. The coefficient of the variable is positive in all specifications however it is only significant at a 10% significance level in the initial model. It is important to note that the magnitude of the coefficient is relatively small in comparison to the foreign equity coefficient implying a much smaller positive effect on industry average profits. The coefficient also substantially diminishes as the remaining control variables are added. The results are however not robust across specifications where the variable is included, thus one can reject the hypothesis, the effect of government equity being significantly different from zero. In addition to the coefficient's insignificance, adding the variable to the model does not add much explanatory power to the model therefore government equity does not seem to be an important determinant of industry average profits. The results are therefore not in line with the expectations and the results seen in Vining and Boardman (1992), as industry average government equity does not seem to have a negative relationship with the industry average profits. It is important to note however that the countries under study have gone through a rapid privatisation process following their transition from socialism to a capitalistic economic system. Governments undertaking privatisation schemes may have given precedence to privatising the least efficient firms first and strategically remained involved in the most profitable plants and industries. Moreover government enterprises tend to be present in industries where the competitive landscape requires a few big players rather that many small firms. Barriers to entry such as high fixed costs means the size of each firm in the market is fairly large but it also means that fixed costs are spread over a higher output value. The nature of such competitive landscape means government involvement is concentrated in industries that are less competitive thus more profitable, which may partially explain the positive relationship.

The fifth control variable included in the model is industry average skill intensity. The coefficient is positive in both specifications it is included in, however, it is insignificant therefore one cannot reject the hypothesis that the effect of skill intensity is significantly different from zero. Adding the variable to the model however significantly increases the explanatory power of the model as R^2 increases from approximately 0.47 to 0.59 which suggest skill intensity is an important variable to include in the model however this is also accompanied by a large decrease in the number of observations. As explained previously, although skilled labour is on average more productive than unskilled labour, skilled workers demand higher wage therefore in theory one cannot conclude whether skill intensity should have a positive or a negative effect. If workers are paid their marginal products then the effect of skill intensity should be negligible. The effect of skill intensity therefore depends on the factor market competition which determines wages for both skilled and unskilled labour and further depends on the scarcity or abundance of each factor. Although insignificant, the positive relationship of skill intensity on industry average profits is in line with the findings of Emami Namini, Lopez, Facchini (2013), who find that exporting Chilean plants are on average more skill intensive. In conjunction with the Melitz (2003) model, exporters are on average more productive given the additional iceberg transport and fixed export costs they have to endure and by their finding also more skill intensive indirectly suggesting a positive relationship between skill intensity and productivity.

The last variable included in the model is the industry average foreign inputs share. In the last model where all variables are included, the coefficient on foreign inputs variable is positive and significant at a 1% significance level. Firm's decision to use foreign inputs stems from the productivity or quality improvement they can gain as a result. Although importing foreign inputs is associated with higher costs due to the transportation costs and any tariff fees incurred, the decision to import the inputs is based on the productivity-cost trade off. One can assume that firms would not use foreign inputs in their production if they were not expected to be of better quality or not produce productivity gains. Foreign inputs share may also capture the effects of using foreign technology as firms import sophisticated foreign machinery in order to make their production process more efficient. In line with the above findings, Amiti and Konings (2007) argue that the use of foreign inputs can have a positive effect on firm productivity predominantly due to the learning effects associated with foreign technology being embodied in the inputs, from higher quality of inputs as well as having more input varieties in disposal making production more flexible.

5.2.3 The effect of EMU on industry average profits

The third model considers the effect of joining the European Monetary Union as a process of trade liberalization on the average firm productivity proxied by the industry average firm profits. Adopting a common currency with your main trade partners eliminates several barriers to trade with respect to transaction costs, exchange rate risk, price transparency, price convergence and so on which should in effect lead to fiercer competition amongst industries present in the monetary union. Applying the underlying theoretical model to this setting, joining the EMU through the mechanism of intra-industry resource reallocation from the least productive to the most productive firms should lead to a higher industry average firm productivity and profitability. The empirical estimation using country, industry and time fixed effects yields some interesting results concerning the role of EMU in stimulating the abovementioned mechanism. With a closer inspection of table 5.3, one can see that all specifications regardless of the control variables included show a positive coefficient on the EMU dummy, however the effect is only significant in models 1, 2 and 6 at a 10 % significance level. The full model with all relevant control variables shows a positive but statistically insignificant coefficient on the EMU dummy. The complete model including all industry specific control variables has an R^2 of 0.59 suggesting the model is relatively well explained by the variables. Overall, the results obtained do not provide sufficient evidence to reject the null hypothesis, thus one cannot conclude with certainty that EMU has significant positive effect on the industry average profits. [22] One of the reasons for the inconclusive results is that joining the EMU may only have a significant positive effect in the long run thus the full microeconomic effects of entering the EMU are yet to materialize. It is important to note that from the sample, only Slovenia, Slovakia and Estonia adopted the Euro in the years 2008, 2009 and 2013 respectively. Given the fact, that this thesis only uses data up to the year 2013, the full effects of adopting a single currency may not yet be reflected in the results. In the short run, adopting a new currency may have a negative effect on firm profits as firms incur substantial 'menu costs'. This means that firms have to completely change their pricing structure as a result of displaying prices denominated in the new currency. Firms may also encounter costs with regards to renegotiating contracts with their inputs suppliers.

[22] H_0: Trade liberalization by the means of entering the European Monetary Union, has no effect on the industry average profits.

Table 5.3: Regression results for the effect of EMU on industry average profits

Variable	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*	*Model 7*
Constant	13.9923*** (0.0407)	12.4110*** (0.2097)	12.4754*** (0.2032)	12.4095*** (0.2038)	12.4257*** (0.2039)	11.9557*** (0.3260)	11.1275*** (0.3709)
EMU	0.5940* (0.3605)	0.5845* (0.3552)	0.5501 (0.3435)	0.4921 (0.3422)	0.4816 (0.3421)	0.8388* (0.5061)	0.7773 (0.5041)
Firm Age		0.5866*** (0.0764)	0.4992*** (0.0743)	0.5020*** (0.0742)	0.4905*** (0.0745)	0.4817*** (0.0993)	0.6380*** (0.1118)
Firm Size			0.0008*** (0.00007)	0.0008*** (0.00007)	0.0008*** (0.00007)	0.0008*** (0.0001)	0.0008*** (0.0001)
Foreign eq.				1.1230*** (0.2712)	1.1627*** (0.2722)	1.2545*** (0.2756)	1.2109*** (0.2783)
Government eq.					0.8545* (0.5141)	0.2252 (0.5155)	0.0938 (0.5237)
Skill int.						0.1676 (0.3165)	0.2706 (0.3171)
Foreign inputs							0.8507*** (0.2348)
Observations	3625	3625	3622	3611	3611	2081	2045
Adjusted R^2	0.4071	0.4243	0.4619	0.4674	0.4679	0.5823	0.5909

Dependent Variable: Logarithm of Industry Average Profit
Independent Variables: Industry Average Export Intensity, Logarithm of Industry Average Firm Age, Firm Size, Foreign Equity share, Government Equity share, Skill Intensity, Foreign Inputs Share
The standard error is in parentheses; * significant at 10%, ** significant at 5%, *** significant at 1%; All variables are calculated as their respective industry weighted averages as described.
Method Used: Panel Least Squares, with country, industry and time fixed effects.

The process can be very time consuming and price disputes may force the companies to look for new suppliers. The above reasons contribute to the argument that after the Euro adoption, firms go through a short run transition period where they face higher costs thus are unable to increase their productivity immediately. Furthermore reallocation of resources does not constitute an instantaneous shift. Capital invested for fixed periods may not be possible to reallocate in the short run and labour market rigidity may make it harder for firms to hire and fire labour as a result of such policy change. Hence the intra-industry resource reallocation which implicitly leads to an increase in the industry average firm productivity may become a lengthy mechanism. However EMU having no significant effect on industry average profits is also plausible, as the magnitude of the benefits may be negligible.

Having a closer look at the control variables included in the specifications of the second model, the results are very similar to the results seen in the first model. The industry firm age has a unanimously positive effect on industry average profits, the coefficient being significant at a 1% significance level and robust across all specifications. The results supports the findings of Jensen et al. (2001), who find that learning by doing effect gives older firms the competitive edge, making them more profitable. Furthermore, economies of scale achieved through various investments and more efficient labour selection also makes mature firms more productive. Similarly, industry average firm size also has a positive and significant effect on industry average firm profits on a 1% significance level, across all specifications. This result is in line with the theoretical prediction of Melitz (2003) which suggests that more productive firms have the competitive edge in the factor markets. Specifically as trade liberalization process occurs, labour shifts from the least productive to the most productive and thus most profitable firms. Trade liberalization through the intra-industry resource reallocation leads not only to a more profitable industry average firm but also to a larger industry average firm. Thirdly, industry average foreign equity once again has a positive and significant effect on the industry average profits, with its coefficient being significant at a 1% significance level and robust across all specifications where the variable is included. This result is in line with the finding of Aitken and Harrison (2001) who find that through technology and intangible assets spillovers, a higher firm foreign equity on average leads to a higher firm profit. Given their conclusion, the same mechanism was hypothesized to be present on the industry level and the expectations were once again validated by the positive results. Government equity coefficient is once again positive but diminishes close to zero as the remaining variables skill intensity and foreign inputs are added. It is only significant at a 10% significance level in its first specification. Due to this, one can conclude that government equity has no significant effect on the industry wide profits. Given the fact the sample only considers state-private joint ventures as the survey excludes plants with full state ownership, the plants' profit motive may be as strong as in private plants, given the management does not necessarily have other political objectives. The positive result may also be explained by the fact that the governments of the countries under study may have strategically remained in more profitable industries following their privatisation period. Skill intensity is once again positive but insignificant in explaining its impact on the industry average profits, although, the variable does add a lot of explanatory power to the model. However this may be down to a large drop in number of observations in estimation, making the remaining data better fit the model. Finally foreign equity is once again positive and significant at a 1% significance level which is in line with the prediction of Amiti and Konings (2007) who expect a positive effect of spillovers associated with foreign technology being embodied in the inputs.

5.2.4 The effect of trade liberalisation on industry average profits with CA dummy

The fourth regression model incorporates the Heckscher-Ohlin theoretical predictions within the estimation, distinguishing between comparative advantage and disadvantage sectors within each economy. According to the theory, countries ought to specialize and export goods which use the relatively abundant factor intensively in production, and as the economy opens up to trade, the industries which use the abundant factor more intensively relative to other industries within the same economy should gain proportionately more from trade. Therefore the analysis is extended within the spectrum of Melitz (2003) theoretical model to include comparative advantage sector dummy as well as its interaction with the trade liberalization signalling variable, the export intensity. Through this analysis, one can consider that international trade occurs both due to consumers' love of variety on the demand side as well as differing country factor abundance on the supply side. Incorporating the predictions of the two trade models will yield some interesting results as it will allow us to see whether the mechanism of intra-industry resource reallocation is intact when controlling for industry specific production intensities.

As it can be seen from table 5.4, trade liberalization modelled by a ceteris paribus increase in export intensity has a positive and significant impact on the industry wide average profits. The results are robust across specifications with the coefficients being consistently significant at a 1% significance level. It is worth noting that the magnitude of the coefficient is somewhat smaller in the full model when incorporating the industry specific CA effect and its interaction with export intensity. Taking the control variables of industry average firm age, size, foreign equity, government equity, skill intensity, foreign input share as well as the industry specific effects using CA dummy and its interaction term into account, the coefficient on export intensity is 0.6736 implying that a 10% ceteris paribus increase in industry average export intensity corresponds to approximately a 6.7% increase in industry average profits. Overall table 5.4 provides strong evidence for one to reject the null hypothesis and validate the conclusions made in the underlying theoretical model; that through the mechanism of intra-industry resource reallocation from the least to most productive firms, opening up to trade leads to a higher industry average productivity parameter as well as a higher industry wide average profit. [23]

The sign and significance of the control variables included are all in line with the results obtained in the previous models. Industry average age has a robust positive and significant impact on industry wide average profitability, in line with the findings of Jensen et al. (2001). Firm size is also positive and significant at a 1% significance level. It is robust across specifications thus it follows the theoretical prediction of Melitz (2003) which implicitly implies more productive firms becoming larger in terms of labour size as a result of trade liberalization. Foreign equity is once again an important determinant of industry wide profits, being positive and significant at a 1% significance level across all specifications. The results support the findings of Aitken and Harrison (2001) who conclude that foreign equity creates various knowledge spillovers that have a direct impact on firm productivity. Government equity has mixed results being positive in two specifications but negative in the full model. The coefficient is small in magnitude and insignificant so we can reject the hypothesis that its effect is significantly different from zero. Skill intensity is once again positive but small in magnitude and insignificant in explaining the impact on industry average productivity.

[23] H_0: The comparative advantage sectors do not gain proportionately more from trade liberalization in terms of industry average profits.

Table 5.4: Regression results for the effect of trade liberalisation on industry average profits with CA dummy

VARIABLE	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*	*Model 7*	*Model 8*
Constant	14.3700*** (0.0635)	14.4012*** (0.0661)	12.9307*** (0.2035)	12.9982*** (0.1968)	12.9582*** (0.1977)	12.9702*** (0.1978)	12.4656*** (0.3101)	11.6306*** (0.3503)
Export int.	1.2835*** (0.2338)	1.0566*** (0.2696)	0.9464*** (0.2661)	0.8349*** (0.2570)	0.6978*** (0.2606)	0.6996*** (0.2605)	0.7968*** (0.3008)	0.6736** (0.3056)
Firm Age			0.5514*** (0.0723)	0.4693*** (0.0702)	0.4729*** (0.0703)	0.4631*** (0.0706)	0.4557*** (0.0934)	0.6572*** (0.1049)
Firm Size				0.0008*** (0.00007)	0.0008*** (0.00007)	0.0008*** (0.00007)	0.0008*** (0.0001)	0.0008*** (0.0001)
Foreign eq.					0.7763*** (0.2606)	0.8100*** (0.2615)	0.8261*** (0.2649)	0.8497*** (0.2670)
Government eq.						0.7280 (0.4860)	0.1923 (0.4818)	-0.0318 (0.4890)
Skill int.							0.2134 (0.2958)	0.3353 (0.2961)
Foreign inputs								0.5724*** (0.2210)
CA sector dummy	-1.5012*** (0.1054)	-1.6037*** (0.1216)	-1.5931*** (0.1199)	-1.5808*** (0.1159)	-1.5665*** (0.1160)	-1.5631*** (0.1160)	-1.4900*** (0.1596)	-1.5253*** (0.1606)
*Export_int*CA*		0.36343* (0.3759)	0.5919 (0.3705)	0.5711 (0.3577)	0.6249* (0.3581)	0.6220* (0.3580)	0.5031 (0.4118)	0.5542 (0.4198)
Observations	3625	3625	3625	3622	3611	3611	2081	2045
Adjusted R^2	0.4712	0.4717	0.4868	0.4719	0.5246	0.5249	0.6352	0.6435

Dependent Variable: Logarithm of Industry Average Profit
Independent Variables: Industry Average Export Intensity, Logarithm of Industry Average Firm Age, Firm Size, Foreign Equity share, Government Equity share, Skill Intensity, Foreign Inputs Share, CA dummy, Export Intensity*CA interaction term
The standard error is in parentheses; * significant at 10%, ** significant at 5%, *** significant at 1%; All variables are calculated as their respective industry weighted averages as described.
Method Used: Panel Least Squares, with country and time fixed effects.

The insignificant results indicate that productivity is in fact a major determinant of wages therefore skill intensity does not play a crucial role in impacting industry profits. Foreign inputs are once again positive and significant in impacting industry profits which is in line with the conclusions of Amiti and Konings (2007). One can now further examine whether the Heckscher-Ohlin model predictions are validated and the CA sectors do in fact benefit proportionately more from trade.

The Heckscher-Ohlin model does not make any specific assumptions on the profitability of the comparative advantage or disadvantage sectors in a closed economy. Plant profits are determined by its demand function and the factor prices which directly influence the profit function. Although a country may be labour abundant, labour demand is a derived demand therefore depends on the goods market. If the domestic consumers have a relatively high preference for capital intensive goods then that will drive the labour intensive goods prices down.

Inspecting the table we can see that the CA industry dummy is consistently negative and significant at a 1% significance level. The magnitude of the dummy is also relatively large meaning that the comparative advantage industries on average perform much worse than their comparative disadvantage industry counterparts. This result may be explained by several different factors. Firstly, it can be argued that labour productivity in the countries under study is relatively low compared to the productivity of capital due to relatively low educational attainment. According to the Solow growth model, returns to capital are relatively high where the initial capital stock is low, which may be the case in the labour abundant Eastern European and Central Asian countries. This could partially explain why capital intensive industries which are the CD sectors are structurally more profitable. Secondly, it can be argued that the goods sold by the relatively labour intensive industries are more homogenous. In effect, each single firm has less market power with respect to the goods market thus the mark-up over marginal costs is smaller in these industries. The corresponding industry structure is therefore not monopolistic but oligopolistic competition yielding lower profits per firm and consequently lower industry average profits. One can assess this position by depicting which industries in the sample are the most and least labour intensive. The most labour intensive industries in the sample are related to the 'Dressing and dyeing of fur; manufacture of articles of fur' and 'Sawmilling and planning of wood' whereas the most capital intensive sectors are those involved in 'Manufacture of fertilizers and nitrogen compounds' and 'Manufacture of jewellery and related articles'. From this evidence, one can conclude that labour intensive goods are in fact more homogenous as we can see that the most capital intensive industries are those with large amount of product differentiation. Thirdly, average industry profits can also be influenced by the level of competition in the industry. In the Melitz setting with free entry, the larger the fixed costs the smaller the number of firms present in the market. This also means each firm's sales has to be larger to cover those fixed costs. If one predicts that capital intensive firms have higher fixed costs due to for example high costs of machinery then the CD sectors in the sample will have less firms per industry thus be structurally less competitive. Industry competitiveness should in effect decrease the industry average profits of CA sectors. Unfortunately, one cannot distinguish from the data, which costs correspond to either variable or fixed costs, however it is found that the average number of firms in the CA sectors is 4.7 firms whereas in the CD sectors it is 6.4 which shows that CD sectors are on average more competitive.

One can now inspect the interaction term between the CA sector dummy and the trade liberalising variable export intensity. The results show that the coefficient is consistently positive however only significant at a 10% significance level in models 2, 5 and 6. This provides some evidence to support the

prediction of Heckscher-Ohlin model, comparative advantage sectors gaining proportionately more from trade liberalisation in terms of profitability. Nevertheless the results provide some indication that the Melitz (2003) and Heckscher-Ohlin models of trade are somewhat complementary, implying that the Melitz relationship between trade liberalisation and industry average profits is intensified for the CA advantage sectors which are predicted to benefit more. However the evidence is not sufficient enough for one to reject the null hypothesis with certainty and conclude that the coefficient of the interaction term is significantly different from zero. [24] Overall, table 5.4 to varying extents supported both theoretical predictions outlined. This means that in line with Melitz (2003), trade liberalisation did in fact lead to a higher industry average profits through intra-industry resource reallocation as well as following the proposition of the Heckscher-Ohlin model, CA sectors profited proportionately more from the process of trade liberalisation.

5.2.5 The effect of EMU on industry average profits with CA dummy

The final model incorporates the EMU dummy as a source of trade liberalization as well as the comparative advantage dummy and its interaction term with the EMU to test how trade liberalization affects industries with varying production factor intensities. This particular model allows us to assess whether EMU constitutes a trade liberalizing process and follows the mechanism described by Melitz (2003) as well as to see whether Heckscher-Ohlin prediction about the beneficiaries of trade liberalization is confirmed within the Melitz setting. Inspecting table 5.5**,** one can see that the EMU dummy is positive across all specifications however it is also consistently insignificant therefore, given there is not enough evidence in support of the proposition that entering the EMU leads to intra-industry resource reallocation and consequently higher industry average profits, one cannot reject the null hypothesis.[25] As previously mentioned the insignificance can be down to the fact that the sample under study only has 3 countries which joined the EMU at the investigated time period. In addition to that the data tested contains information until the year 2013 meaning that the full microeconomic effects have not fully materialized. In the short run firms may face substantial costs with regards to changing their menu pricing as well as costs related to renegotiating input and output contracts. Moreover, price transparency will only be a benefit once foreign consumers are aware of the domestic goods. However it could also be the case that entering the EMU does not produce significant microeconomic benefits as propagated by European institutions.

All industry-wide control variables are showing signs and significance as expected and seen in previous models. Industry average age is consistently positive and significant, supporting the findings of Jensen et al. (2001). The industry average firm size with respect to number of employees is also positive and significant at a 1% significance level. The result is robust across specifications proving the Melitz (2003) hypothesis that more productive firms are structurally bigger following trade liberalization. Due to increasing returns to scale assumption in the model, firm that employs higher volume of labour is more profitable as it can take advantage of economies of scale. Industry foreign equity variable is also consistently positive and significant proving that technology and knowledge spillovers play a crucial role in increasing productivity as propagated in Aitken and Harrison (2001).

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[24] H_0: Comparative advantage sectors do not gain proportionately more from trade liberalization in terms of industry average profits.

[25] H_0: Trade liberalization by the means of entering the European Monetary Union, has no effect on the industry average profits.

Table 5.5: Regression results for the effect of EMU on industry average profits with CA dummy

Variable	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*	*Model 7*
Constant	14.5530***	12.9829***	13.0427***	12.9789***	12.9914***	12.4715***	11.6217***
	(0.0552)	(0.2031)	(0.1962)	(0.1973)	(0.1974)	(0.3107)	(0.3512)
EMU	0.4434	0.3784	0.3601	0.3085	0.3010	0.8374	0.7330
	(0.3721)	(0.3662)	(0.3531)	(0.3525)	(0.3524)	(0.5273)	(0.5248)
Firm Age		0.5826***	0.4959***	0.4982***	0.4885***	0.4935***	0.6840***
		(0.0726)	(0.0705)	(0.0705)	(0.0708)	(0.0934)	(0.1051)
Firm Size			0.0008***	0.0008***	0.0008***	0.0009***	0.0008***
			(0.00007)	(0.00007)	(0.00007)	(0.0001)	(0.0001)
Foreign eq.				0.9123***	0.9457***	0.9906***	0.9912***
				(0.2578)	(0.2587)	(0.2607)	(0.2622)
Government eq.					0.7129	0.1705	-0.0504
					(0.4880)	(0.4851)	(0.4918)
Skill int.						0.2322	0.3473
						(0.2985)	(0.2983)
Foreign inputs							0.6421***
							(0.2215)
CA	-1.5391***	-1.5411***	-1.5273***	-1.4999***	-1.4969***	-1.3814***	-1.4053***
	(0.1083)	(0.1066)	(0.1029)	(0.1030)	(0.1030)	(0.1294)	(0.1307)
EMU_CA	0.3458	0.5267	0.4766	0.4909	0.4870	0.2350	0.1054
	(0.4689)	(0.4619)	(0.4454)	(0.4443)	(0.4442)	(0.6809)	(0.6752)
observations	3625	3625	3622	3611	3611	2081	2045
Adjusted R2	0.4636	0.4806	0.5172	0.5205	0.5208	0.6300	0.6393

Dependent Variable: Logarithm of Industry Average Profit
Independent Variables: Industry Average Export Intensity, Logarithm of Industry Average Firm Age, Firm Size, Foreign Equity share, Government Equity share, Skill Intensity, Foreign Inputs Share, CA dummy, EMU*CA interaction term
The standard error is in parentheses; * significant at 10%, ** significant at 5%, *** significant at 1%; All variables are calculated as their respective industry weighted averages as described.
Method Used: Panel Least Squares, with country and time fixed effects.

Government equity once again has conflicting results as it shows to be both positive and negative in various specifications. The results are not significant thus one can conclude the coefficient is insignificantly different from zero. This result contradicts the findings of Vining and Boardman (1992), however this may due to the sample of countries studied. Eastern European and Central Asian economies may not interfere too much in the management of state-private owned joint ventures thus not having a negative effect on profits. In addition, their incentives may not deviate from a profit and efficiency motive thus their political agenda may not interfere in the business decisions. Industry skill intensity is once again insignificant in determining profits meaning that workers are more likely to be paid according to their productivities rather than wages being driven by skill scarcity or abundance. Foreign inputs once again show a positive and significant effect on industry average firm profits. This result is consistent with the prediction of Amiti and Konings (2007) who explain foreign technology embodied in foreign inputs produces positive spillovers.

The comparative advantage industry dummy once again is consistently negative suggesting industries which are relatively more labour intensive within each country perform relatively poorly in comparison to their capital intensive industry counterparts. This result is consistent with the previous model and may be down to several factors. As previously mentioned labour productivity may be low in the countries under study, implicitly making capital intensive industries relatively more productive and thus more profitable. Secondly the nature of the products between the CA and CD sectors may vary in terms of homogeneity of the goods sold. It can be argued that CA labour intensive sectors produce goods which are relatively more homogenous making the markets they operate in more competitive, having a direct downward effect on the profits. Thirdly, industry average profits can also be influenced by the competitive structure caused by the level of fixed costs in the respective sectors. One can argue that capital intensive, CD industries have higher fixed costs due to for example a high cost of machinery. This leads to those industries being less competitive, given the fact that high fixed costs directly leads to lower number of competitor firms within the Melitz setting with free entry. In addition to the above arguments, many countries in the sample by law have a set minimum wage which may potentially be above equilibrium as well as the countries may still possess strong labour unions which actively lobby for fair wages and job security making labour markets relatively rigid. This means labour intensive firms would be less flexible in adjusting their costs during changing market conditions, indirectly making them less profitable on average. This is especially likely to be the case in countries which have transitioned from socialism to free market economies where labour union protection was strong.

The interaction term is once again positive but insignificant in all specifications, the magnitude is also a lot smaller in comparison to the previous model. The results therefore do not produce sufficient evidence for one to reject the null hypothesis.[26] This result is logical given the lack of evidence for EMU creating any significant positive benefits for industries regardless of factor intensities. If entering the EMU does not constitute an adequate trade liberalisation process then the above results do not necessarily contradict or invalidate the conclusions of Heckscher-Ohlin theory of trade. This is because without trade liberalisation taking place, the mechanism of enhanced international trade stemming from factor abundance is not triggered. Once again it is important to take into consideration the fact that the sample investigated spans only up to the year 2013. In addition the countries which joined

[26] H_0: Comparative advantage sectors do not gain proportionately more from trade liberalization in terms of industry average profits.

the EMU, entered towards the latter years of the sample time frame which may have meant that the microeconomic benefits have not yet been reflected in the data. Nevertheless the consistently positive magnitude of the interaction term's coefficient to a small extent suggests some complementarity between the Melitz (2003) and Heckscher-Ohlin models of trade.

6. Conclusion

Following the financial crises the macroeconomic effects of being in the EMU have been extensively discussed and researched. Early literature has estimated that the intra-European trade increased between 5 to 10 percent as a direct impact of adopting a common currency (Baldwin, 2006). The forecasted effect for the future CEE entrants was found to be similar (Belke and Spies, 2008). As a result, this research paper argues that entering the European Monetary Union represents a trade liberalising process. More specifically the outlined benefits of joining the Euro including the elimination of exchange rate risk and transaction costs, exchange rate stability, price transparency, price convergence as well as macroeconomic stability should in effect reduce the costs associated with exporting and stimulate more competition within the European economies.

This thesis, in association with to the underlying theoretical model of Melitz (2003), empirically investigates the impact of trade liberalisation on the micro-level adjustments triggered by the mechanism of intra-industry resource reallocations. The theoretical model incorporates Dixit-Stiglitz type consumer preferences, increasing returns to scale and firm heterogeneity in terms of firm total factor productivity to explain the impact of trade liberalisation on the industry average productivity parameter. More specifically, the model explains that opening up to trade leads to an increase in the cut-off productivity parameter which induces the least productive firms to exit the market and triggers intra-industry resource reallocation from the least to the most productive firms. Furthermore, the model shows that only the most productive firms export due to the relatively higher costs of supplying foreign markets and that trade liberalisation eventually leads to a higher industry average productivity and higher industry average profits. The model is then extended to incorporate the Heckscher-Ohlin conclusions into the Melitz setting to investigate whether opening up to trade yields complementary results. More specifically, a comparative advantage sector dummy is constructed to test whether the underlying model's conclusions are intensified for specific industries, namely whether CA sectors gain proportionately more from trade in terms of profitability. The empirical model makes use of an unbalanced panel firm level data for 29 Eastern European and Central Asian countries, obtained from the World Bank's Business Environment and Enterprise Performance Surveys (BEEPS). The full dataset contains comprehensive information for 21972 firms across 191 industries for the time period 2003-2013. The firm level data is used to calculate the weighted average industry specific variables in relation to firm sales, costs, profits, age, size, ownership structure, skill intensity and inputs origin. The empirical model then employs fixed effects panel least square estimation to draw conclusions on the impact of trade liberalisation on the industry average export intensity and industry average productivity. Given the supportive theoretical and practical reasoning, industry average profits are used as an effective proxy for industry average productivity. The paper then estimates various empirical models and regression specifications controlling for country, industry and time fixed effects which give rise to some interesting results. The key findings of the paper are the following. Strong and robust evidence is found for trade liberalisation modelled by a ceteris paribus increase in industry export intensity, having a positive effect on the industry average firm profits. These results in effect prove that intra-industry resource reallocation mechanism plays an important role in instigating

industry productivity gains. Some evidence is also found for EMU having the same effect, however the results are not robust across specifications. Moreover, weak evidence is found for EMU having a significant impact on increasing industry average export intensity. This may be explained by the fact that for the countries in the sample, adopting the Euro occurred at the latter stages of the time period investigated, therefore the effects may not yet be reflected in the data. In terms of the model extension, some evidence is found to support the hypothesis that CA sectors gain proportionately more from trade liberalisation meaning some model complementarity can be observed. Therefore it can be concluded that Heckscher-Ohlin conclusions, to an extent intensify the hypothesised relationship between trade liberalisation and average firm productivity. The evidence is again weaker for EMU instigating the same model complementarity however EMU's long term impact is still open to question.

Overall it can be concluded that trade liberalisation does in fact follow the mechanism described by Melitz (2003) and poses significant aggregate welfare gains for industries and countries as a whole. However, the jury is still out on EMU, and its impact on producing productivity gains across industries. Assuming the full benefits of joining the EMU for recent Eastern European entrants are yet to materialise, the judgment should be spared for future research when new data becomes available. The estimation would also potentially benefit by including more EMU insiders in the model if such firm level data can be found in a common standardised dataset. Furthermore it would be interesting to study what effects recent EMU entrants have had on EMU insiders and their respective industries. Given the fact first evidence is somewhat positive, policy advisors should embrace further European integration with respect to stimulating more competitiveness in the European single market. For the purpose of a more tailored policy advice, focus can also be shifted towards the mechanism of productivity improvements and accurately measure whether productivity increases stem from the intra-industry resource reallocation or a within firm productivity gains and further distinguish how these differ between industries. Lastly, further studies could also incorporate the extension of the Melitz theoretical model developed by Baldwin and Nicoud (2004) who demonstrate that there is a trade-off between static and dynamic gains in productivity. The model is extended by endogenising the productivity parameter and its growth rate, which shows that liberalising trade does in fact increase the average productivity level but slows the productivity growth. Future research could test this hypothesis empirically, and if the model's predictions are validated it could have significant effects on the long term productivity gains.

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