

Between and within income inequality in OECD countries

The role of trade and financial openness.

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Abstract

This paper analyzes the effects of trade and financial openness on income divergence between and within 35 OECD countries in the last two decades. Our model takes into account both short run and long run effects of regressors. We estimate an error correction model in which per capita GDP and inequality are driven by changes over time of selected factors and by the deviation from a long run relationship. We disentangle our sample in three groups according to the level of countries per capita GDP. Our contribution to the existing literature is threefold: i) we study the short and long run effects of trade and financial openness on income level and distribution, ii) we focus on OECD members that despite having different level of per capita income and inequality are the most developed countries in the world and iii) we provide a sensitivity analysis including in our baseline equation an institutional indicator, a trade agreement proxy and a dummy for the global financial crisis. Estimates results indicate that trade openness improved both in short and long run mostly the conditions of low income countries, consistently with the neoclassical catching up theory. It also decreased inequality in low and middle income countries, both in the short and long terms. Differently financial openness had a positive and significant impact only in the short run on middle income countries and increased income disparities within countries in the short term in low income countries and in the long term in high income countries.

Keywords: Trade openness, Income inequality, Panel data analysis

JEL Classification: D63, D31, O15, H23

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1 Introduction

The impact of globalization on income level and distribution is at the center of the current international economic policy debate especially at OECD level. Trade has been an engine for growth in many countries by enhancing efficiency and widening the market for national products. Nevertheless, increasing trade and financial flows between countries, in conjunction with technological progresses, are often cited as worsening income inequality and growth rates disparity. In this regard, opinions oppose between economists who argue that free trade is the key to economic growth and eventually reduces inequalities and others arguing that the openness might itself be a factor of inequality, at least in the short run, fostering the progress of few high competitive firms and the remuneration only of specific jobs. Notably, the inequality induced by globalization could be either regarded as physiological, being associated to more efficient use of resources, or considered “unfair”.

The effect of trade agreements on income and growth is controversial too. On the one hand, lowering trade barriers is likely to foster international trade by reducing transaction costs, which in turn can enhance economic growth rates. Likewise, it can be argued that economies that are more open to the rest of the world have more chances to take advantage of technologies developed elsewhere. On the other hand, it has been argued that some forms of protectionism can be beneficial for economic development in the long run to strengthen certain industries or sectors or a strategic trade policy in key sectors. The empirical literature on this issue is inconclusive especially for what concerns the advanced economies and the period after the Great Recession, as argued by Georgiadis and Gräß (2016) among the others.

The present study aims to analyse the effects of globalization on growth and income inequality in OECD countries, where most factors explaining the divergence in emerging countries (e.g. technology and education), have arguably a minor effect. It also takes into account that trade and financial openness might have different, and possibly opposite, outcomes in the short and in the long run and across countries, thus determining both winners and losers. For example according to Autor, et al. (2014)¹, globalization process produced decreasing inequality among countries, but increasing disparities among households, particularly between very rich and very poor individuals, and the popular interpretation of this evidence is that trade and finance have concentrated high skill jobs in few countries and shifted low skilled jobs toward less developed countries .

Specifically, this paper draws on two different though related strands of empirical research. The first examining the impact of international trade on between countries income convergence Starts from the Frankel and Romer (1999) seminal paper². Many empirical studies supporting or opposing trade openness drew their results from cross sectional data and were subject to an

¹ The Heckscher-Ohlin theorem had already foreseen this unpleasant consequence of international trade, predicting a reduction of the share of workers in advanced countries, where capital is relatively abundant, as pointed out by Feenstra and Hanson (2003). An extreme consequence of the same theorem is the concern for an “immiserizing growth” occurring when the combination of terms of trade and labour shift across countries worsens the economic conditions of some countries, and particularly of workers, as remarked by Samuelson (2004), among the others.

² Frankel and Romer (1999) studied the impact of trade on income. They used data for 150 countries for the year 1985. In order to correct for the endogeneity of trade, they employed Instrumental Variable (IV) techniques, and used country’s geographic characters such as countries’ distance from their trading partners as instruments for trade. They showed that trade has statistically significant impact on income across countries.

important criticism in terms of estimates robustness. In particular, Edwards (1998) and Rodriguez and Rodrik (2000) argue that the strong results in favor of openness may arise from mis-specified models and/or openness measures may be acting as a proxy for other macroeconomic policies or other important omitted factors such as institutions and geography³.

However the literature results are inconclusive. In fact, criticisms of free trade and the current debate suggest that income disparity is triggered by international trade only between heterogeneous countries. On the other side of the argument, some authors suggest that movement toward free trade may lead to a reduction in income inequality across countries (Ben-David, 1993). Bourguignon and Morrisson (2002), in their studies of historical trends in globalization and inequality, conclude that globalization was a driving force for between-country convergence since the 19th century. However, Dowrick and Golley (2004) reveal that while trade openness promoted convergence in the 1960s and 1970s, since 1980 the benefits of trade are mostly attributed to the richer economies, with modest benefits to the less developed economies. Sala-i-Martin et al. (2004) finds that overall global inequality has been falling since 1980, due to between-country convergence.⁴

The effects of trade on incomes in the advanced countries have been much studied, beginning with a number of works on wage distributions in the 1990s, to more recent papers on the effects of globalisation on the labour share (Elsby et al. 2013), wage inequality (Ebenstein et al. 2015), and routine middle class jobs (Autor et al. 2014). More specifically in advanced economies, the ability of firms to adopt labor saving technologies and offshoring has been cited as an important driver of the decline in manufacturing and rising skill premium (Feenstra and Hanson 2003). However Quah (1996) showed that income convergence, if any, occurs within different “clubs” of countries, rather than across all the economies at the same time.

Trade openness might have mixed effects on the wages of unskilled labor in advanced countries. It raises the skill premium for some selected jobs, but could also increase overall real wages by lowering (mainly import) prices (Munch and Skaksen 2009). At the same time, increased trade flows could lower income inequality by increasing the demand and wages for abundant lower-skilled workers, but only if low-technology good and services are produced within the same country, that is less plausible.

The second strand of research analysed the impact of international trade on within income inequality. Lakner and Milanovic (2016) popularised the “elephant graph” representing income dynamics between 1988 and 2008. It shows that very poor households, belonging to the first decile of income distribution, benefitted only to a minor extent from overall growth; income growth rate increased until the median income earners drawing the back of the elephant in the graph; the growth rate fell close to 0 for the households in from the 7th to the 9th decile of income distribution and picked up for the richest households, resembling the elephant’s trunk.

³ The mechanisms through which globalization affects income distribution are country, time, and case specific. Importantly, the impacts of trade liberalization need to be examined in conjunction with other concurrent policy reforms, and the implementation details of particular policies matter. For that reason, relying solely in pooled studies might not conduce to satisfactory policy prescriptions.

⁴ For an extensive survey of literature see Aradhyula, Rahman, Kumaran, 2007

In any case, the pattern of inequality in the last decades is not homogeneous, as found by many empirical studies, such as OECD (2011), Atkinson and Bourguignon (2014), Dabla-Norris et al (2015) and Ravallion (2016). Indeed, economic theory and empirical studies point out that inequality depends on many factors, and particularly from the trade-off between the two variables accepted by governments, as pointed out at least since the seminal papers of Atkinson (1970) and recently documented also by Green (2016)⁵. Another key factor for the diffusion of income inequality is the shift of revenues from labour to capital, as pointed out also by Glyn (2009), due to the increasing productivity of capital fostered by the new technologies.

Many papers provide evidence of a positive relationship between trade openness and inequality in developed countries⁶. They obtain different estimates of the reactivity of inequality to trade and financial openness, depending on the estimation sample, the statistical techniques adopted and the control variables included in the models. For instance, Lim and McNelis (2016) use a panel of annual data from 1992 for about 40 countries below the average world's per capita GDP and find an elasticity of the Gini index about 0.05, albeit it about doubles for low-income countries and turns to negative for upper-middle countries. Bumann and Lensink (2016) report an average elasticity of the same inequality index to financial openness, measured by the Chinn and Ito (2008) index, close to 2, considering 106 countries over the time period 1973 to 2008 and controlling for inflation, trade openness, financial depth, per capita GDP, education and demographic indicators. They also adopt a GMM estimator to treat the possible endogeneity of some explanatory variables and conclude that financial liberalization improves income distribution in countries where financial depth is higher.

Dabla-Norris et al. (2015) study about 100 countries, including the most advanced economies, during the period 1980–2012, and estimate an elasticity of Gini index that is negligible to trade openness and is 0.05 respect to financial openness. Their reference model, that builds on Jaumotte, Lall, and Papageorgiou (2013) includes among the control variables also: education, financial depth and some indicators on the structure of population and labour market, other than public expenditure. Roser and Cuaresma (2016) estimate a model on a panel of 32 developed countries over the last four decades by using GMM and find an elasticity of Gini index to trade openness about 0.01, controlling for public expenditure, GDP growth, per capita GDP and international trade structure.

In this study, we use an ECM model applied to panel data to investigate the trade's impact on levels and distribution of income in the main OECD countries. Our contribution to the existing empirical literature is threefold: i) we study the short and long run effects of trade and financial openness on income convergence, by using an error correction model (ECM); ii) we focus on OECD countries that despite having different level of income per capita and inequality are arguably part of the same "club", sharing similar technologies and human capital levels and iii) we provide a sensitivity analysis introducing in the estimates a dummy for the global financial crisis, an institutional indicator, a trade agreements proxy and interacting the trade openness with the two latter regressors.

⁵ First of all, tax and benefit policy plays a major role in equalizing income distribution, as recently documented by Figari et al (2015) for the European countries and by Bargain and Callan (2010). Goldin Katz (2008) also focus on the role of education, that contribute to improve human capital and to equalize opportunities among workers.

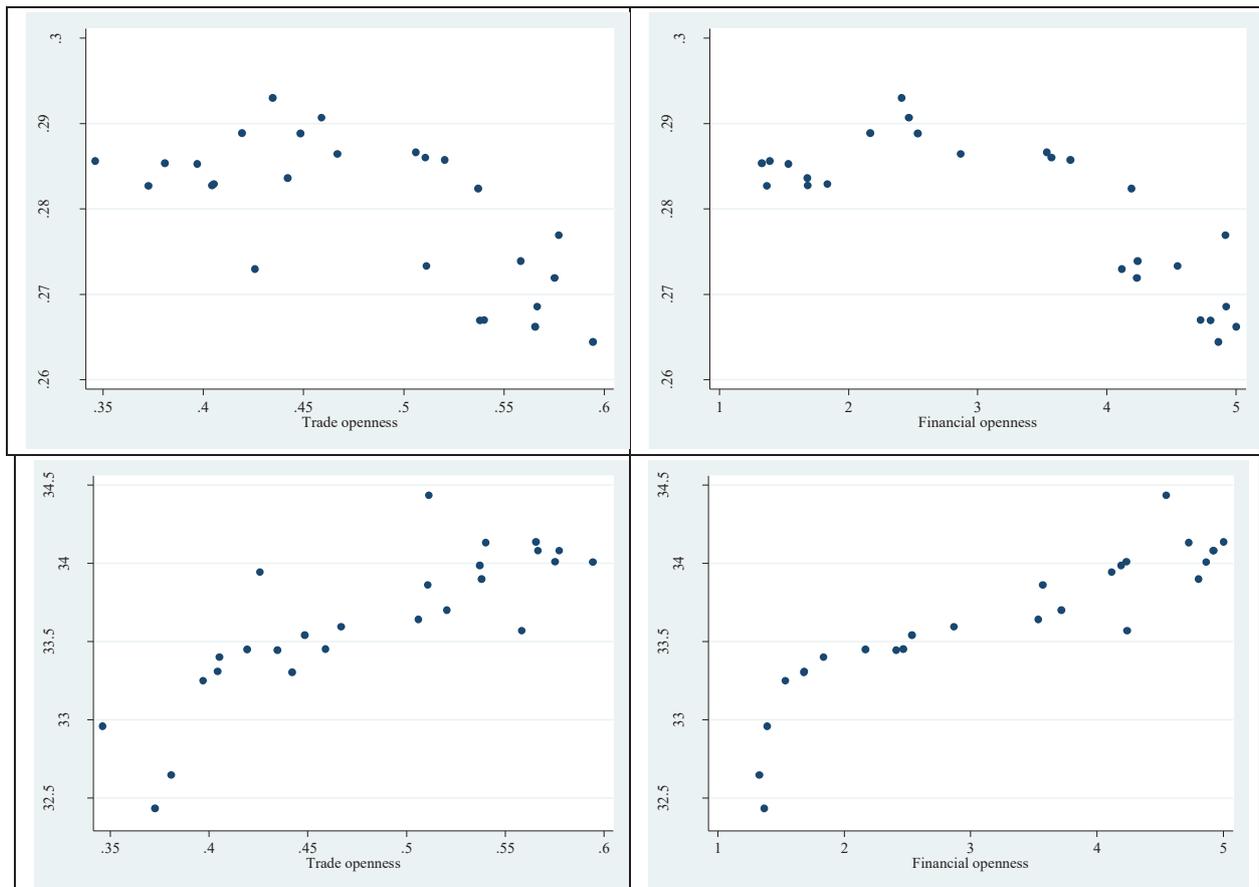
⁶ For instance, Helpman et al. (2012) and Akerman et al. (2013) analyse the role of trade in increasing intra-sector wage disparity in a number of developed and developing countries.

The paper is organized as follows. Section 2 reports the main stylized facts on trade openness and income distribution in the OECD countries. Section 3 describes equations, dataset and empirical strategy. Section 4 presents the econometric results, while section 5 reports robustness checks. Conclusions and policy implications follow.

2 Some stylized facts on globalization and income inequality between and within the OECD countries

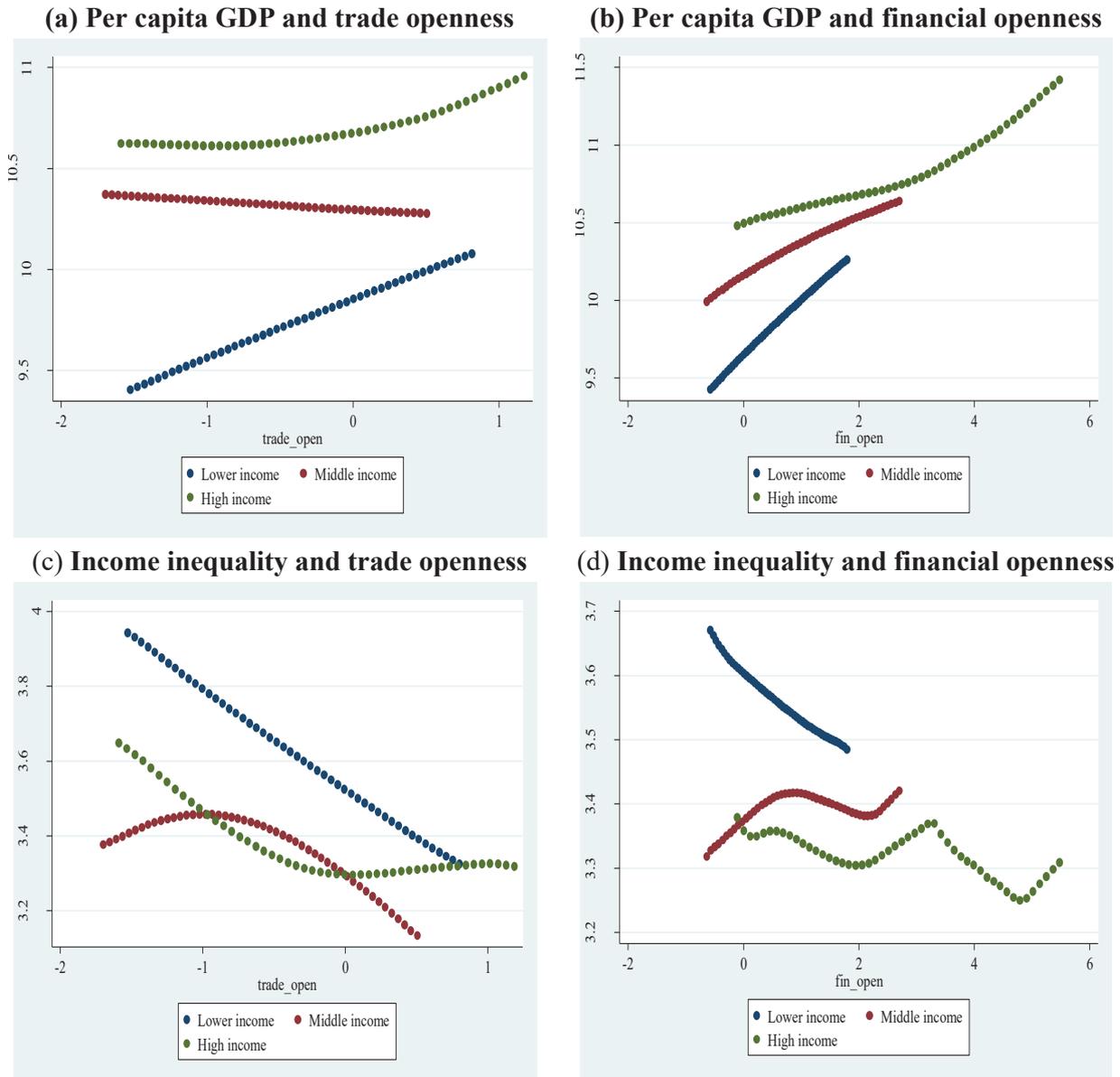
All in all in the OECD trade and finance integration seem to have contributed to reduce the gaps of per-capita incomes across the countries over time, as shown in the highest panels of chart 1, albeit the relationship between income dispersion and openness is strongly non-linear. Indeed, openness tends to widen or to keep almost constant income disparities before a given threshold, and to reduce it afterward. On its turn, income inequality within each country seems to increase as the globalization proceeds, as the lower panels of chart 1 suggest. Notably, the effect of trade and financial openness on domestic inequality is much more linear than in the previous case.

Chart1 – Globalization and income inequality between and within the OECD countries
(yearly weighted averages)



Non-parametric smoothing⁷ provides further insights on this issue.

Chart 2 – Non-parametric smoothing



⁷ Kernel-weighted local polynomial smoothing, described by Fan and Gijbels (1996), provide a tool to interpolate a set of points (x_i, y_i) linked by the following relation $y_i = m(x_i) + s(x_i)e_i$ where $m(\cdot)$ and $s(\cdot)$ are unknown (likely non-linear) functions linking the mean of y_i ; mean with the mean of x_i ; and the size of the error term is assumed to vary with x_i , under the hypothesis that e_i is normally distributed with $E(e_i) = 0$ and $\text{Var}(e_i) = 1$. The estimation method locally approximates the function $m(x_i)$ by means of a polynomial of order p : $(x_i - \bar{x}), (x_i - \bar{x})^2, \dots, (x_i - \bar{x})^p$, where \bar{x} is the x_i mean and p is an integer to be empirically determined, but in general less than 3. The estimation is based on a weighted average of contiguous data, sorted according to variable x_i , giving priority to those belonging to a defined “window” whose optimal amplitude must be defined empirically depending on the required smoothness of interpolated data. See Fan and Gijbels (1996).

Moreover in order to understand if income level affects the relationships between globalization and inequality, we disaggregated the OECD countries according to their per capita GDP level in groups each including one third of countries, henceforth named “low”, “middle” and “high” income countries⁸.

Chart 2 (a) reports the relationship between trade openness and per capita GDP. There is a clear positive relationship with respect to high and low income countries, but not with respect middle income economies. In chart 2 (b), financial openness seems to have an homogeneous effects on national income. Apparently, the volume of per capita GDP grows as the stock of foreign assets and liabilities divided by GDP increases in the three groups of countries. In any case, it is evident a positive relationship between financial integration and all the three group of countries.

The relationships between globalization and income inequality within each country seems to be more complex. The evidence presented in chart 2 (c) shows, with some discontinuities, a negative relationship between international trade and personal incomes divergence which is particularly evident for middle and low income. The relationship seems to be strongly non-linear in low and high income economies.

Eventually, chart 2 (d), displays the relationship between financial openness and income inequality. There is a clear negative relationship only for low income countries. However, the curve due to its not linearity makes difficult a clear-cut interpretation. It is worth to underline that the charts simply represent the correlation among the variables, not taking into account the possible effect of other factors shaping the dynamics and the distribution of growth, inequality and openness. Thus in what follows we will formulate and estimate an econometric model in order to disentangle the marginal contribution of each factor to between and within income inequality.

3. Equation, dataset and empirical strategy

Differently from the most of the empirical literature on this issue, our model specification takes into account both the short run effects of per capita income and inequality explaining factors, that arguably might be relatively small and temporary, and their long run impacts. We estimate an error correction model (ECM), in which the dynamics of growth and income inequality are driven by short run elasticity with respect to some selected influencing factors and by the deviation from a long run relationship. Pesaran et al. (1995) and Westerlund (2007) analyse the estimation of ECM models using panels of data.

The linear formulation of the model is:

$$\Delta y_{it} = \sum_j \alpha_j \Delta x_{jit} - \beta_0 (y_{it-1} - \sum_j \beta_j x_{jit-1}) + \delta_i + \theta_t + u_{it} \quad [1]$$

⁸ Low per capita income countries includes: Brazil, Chile, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Mexico, Poland, Portugal, Slovak Republic and Turkey. Middle per capita income countries includes: Finland, France, Greece, Iceland, Israel, Italy, Japan, Korea, New Zealand, Slovenia, Spain and United Kingdom. High per capita income countries includes: Australia, Austria, Belgium, Canada, Denmark, Germany, Ireland, Luxembourg, Netherlands, Norway, Sweden, Switzerland and United States.

where the change between the periods of time $t-1$ and t of the endogenous variable y measured on the i -th individual of the panel is explained by the changes of a number of explanatory variables x_j whose short run impact on Δy_{it} is measured by the parameters α_j ; the past deviation of y_i from the long run relationship $\sum_j \beta_j x_{jit-1}$; a set of country dummies δ_i representing almost time invariant country specific omitted variables, and time dummies θ_t representing common time-varying factors not included in the model; the idiosyncratic term u_{it} . The convergence speed to the long run relationship (not necessarily an equilibrium condition) is measured by the *positive* parameter β_0 .⁹ A generalization of [1] includes a set of long run relationships, corresponding to possible multiple cointegration relationships among the variables y and x_j .

The formulation [1] holds both for stationary and non-stationary time series, but in the latter case the long run relationship exists, i.e.: β_0 is not null, only if y and x_j are cointegrated. Assuming that no explanatory variable is endogenous, the model [1] can be estimated consistently by running a standard fixed effects GLS, as shown by Westerlund (2007). Alternatively, a two-step procedure can be adopted, similar to the one originally proposed by Engle and Granger (1987) for time series data. In the first step the static long run relationship

$$y_{it} = \sum_j \beta_j x_{jit} + \delta_i + \theta_t + v_{it} \quad [2]$$

is estimated by using GLS, since cointegration of non-stationary variables grants the “super-consistency” of estimates (but not of corresponding standard errors), as shown by Stock (1987).

We test our model for the period 1995-2016 for 35 OECD countries. Consistently with the descriptive analysis we disentangle our regressions in three groups (low, middle high) according to countries’ level of GDP per capita.

The aforementioned literature suggests that a reliable model explaining income inequality between and within countries should include explaining variables, in addition to per-capita income starting level and trade and financial openness. For instance, the level of human capital, the structure of foreign exchanges, industrial structure, fiscal policy, FDI and market liberalization should be considered¹⁰. Nevertheless, this study focuses on the OECD countries and on the last few decades, during which income inequality within each country apparently kept rising again after the “great levelling” of the middle part of the past century.

Thus most candidate explaining variables arguably vary only a little along the time and maybe across the countries, thus their influence is captured by a combination of country dummies, that implicitly take into account permanent differences in human capital, sectorial specialization, business environment, etc., and time dummy, that ideally account for the effect of common shocks and a common evolution of omitted (and unobservable) variables.

⁹ A negative value of β_0 would signal a permanent divergence from the supposed long run relationship, that casts doubts on the existence of the latter “attractor” itself.

¹⁰ See also Tridico (2015)

Relying on previous literature we include in the regressions explaining national per capita GDP in volume (*GDP_pck*) and income inequality (*ineq*)¹¹ the following common set of variables, all transformed in logarithms: i) a trade openness indicator (*trade_open*); ii) a *de facto* measure “financial openness index (*fin_open*) given by the sum of financial assets plus liabilities divided by the GDP of the previous period in order to reduce endogeneity problems, iii) the terms of trade (*terms_trade*); iv) the value added per employed person with tertiary education (*lp_a*) as a proxy of the contribution to growth of human capital; and v) the public expenditure divided by previous year GDP (*pe_GDP*). In addition the labour share (LS) has been included in the inequality equation.

The key variables for our analysis are *trade_open* and *fin_open*, while the other should be considered mainly as control variables introduced to strengthen the model moderating the omitted variable problems. It is worth to underline that there is no unique indication in which manner trade should enter growth estimations. A commonly used measure in the analyses of the relationship between trade and growth is total trade volume (of both goods and services) as a share of total GDP (*trade_open*). The trade-to-GDP ratio is often referred to as the “trade openness ratio”. Following (Busse Konninger 2012) we use *trade_open* calculated as exports and imports of goods and services in current US\$ divided by total GDP in current US\$ lagged by one period. Tables with the description, data sources and descriptive statistics of the variables are provided in the appendix. As for the financial openness indicator we selected a *de facto* indicator because we did not use the Chin Ito index which is a *de iure* index of financial integration because it has a very low variability after 1995 across OECD members and available data end in 2011.¹²

3. Estimates results

The ECM model [1] has been estimated using GLS mainly to assess the relevance of trade and financial openness in explaining the disparities of per capita GDP growth across OECD countries and their effect on income inequality, measured by the Gini coefficient, within the same countries. As we have already underlined the ECM model allows to distinguish between the short and long run effects of the aforementioned regressors.

Table 1 presents the estimates results for the whole sample and for the countries divided in the three GDP per capita groups (low, middle and high income). The estimates show with no exception in the short run that the trade openness in the period 1995-2016 had a positive impact on growth although the coefficients have different magnitudes and being the greatest for low income countries. Thus, trade seems to improve mostly the conditions of low income countries,

¹¹ In our model we preferred to use the Gini coefficient since it has a wider coverage and comparability in terms of years and countries than other, possibly more accurate, inequality measures.

¹² All those measures might be highly imperfect. One of the drawbacks connected with *de facto* measures is that the choice in favour of one of them leaves the information contained in all the others *de facto* measures aside. Thus, whatever measure of actual financial integration is chosen, it risks containing incomplete and thus distorting information on the process. On the other hand, the *de iure* indicators, even though in a majority of cases they are based on summary information revealed in the IMF’s AREAER reports, should in principle contain more complete information on the formal – and potentially also on actual – financial liberalization than *de facto* measures do. Consequently, especially in the case of more developed economies, to the extent to which *de iure* financial openness leads also to *de facto* liberalization episodes, the former could be to a certain degree treated as a proxy for the latter.

consistently with the neoclassical catching up theory stating that low income countries grow faster in order to converge to the income of more advanced countries.

The middle income group tends to react less to the trade openness than the two other groups this determines the fact that its income convergence is weaker than in the other two groups. This result is in line with the evidence provided by the descriptive paragraph and with the decrease of the overall income inequality between countries pointed out by the literature on trade globalization advantages.

Table 1 Estimates results: income convergence between countries

	OECD	low income	middle income	high income
Short run effects				
D.trade_open	0.0888*** (0.0137)	0.266*** (0.0729)	0.0664*** (0.0209)	0.0797*** (0.0216)
D.fin_open	0.0141* (0.00764)	-0.0204 (0.0524)	0.0182** (0.00921)	-0.00534 (0.0131)
D.terms_trade	-0.0551* (0.0297)	0.0163 (0.265)	-0.104** (0.0486)	-0.0404 (0.0386)
D.ppe_GDP	-0.153*** (0.0191)	-0.229** (0.0882)	-0.137*** (0.0341)	-0.163*** (0.0218)
D.int_GDP	-0.00637** (0.00280)	-0.0223 (0.0151)	-0.00301 (0.00395)	-0.00363 (0.00445)
D.lp_a	0.0273** (0.0108)	-0.0313 (0.0492)	0.0203 (0.0184)	0.0331** (0.0148)
Long run effects				
L.GDP_pck	-0.0897*** (0.0130)	-0.102* (0.0596)	-0.0599*** (0.0225)	-0.0959*** (0.0249)
L.trade_open	0.0689*** (0.00952)	0.258*** (0.0621)	0.0820*** (0.0172)	0.0239* (0.0140)
L.fin_open	0.00394 (0.00421)	0.0375 (0.0415)	0.00251 (0.00588)	-0.00169 (0.00652)
L.terms_trade	0.0288** (0.0119)	-0.0897 (0.277)	0.0352 (0.0228)	0.0157 (0.0139)
L.ppe_GDP	-0.0941*** (0.0138)	-0.182 (0.109)	-0.125*** (0.0229)	-0.0974*** (0.0178)
L.int_GDP	0.00224 (0.00184)	-0.0159 (0.0172)	0.00288 (0.00300)	0.00914*** (0.00266)
L.lp_a	0.0269*** (0.00530)	-0.0394 (0.0479)	0.0273*** (0.00776)	0.0285*** (0.00875)
Constant	1.403*** (0.158)	1.537 (0.974)	1.233*** (0.269)	1.475*** (0.286)
Observations	513	65	222	226
R-squared	0.692	0.914	0.687	0.776
Number of cod	26	4	11	11
Country FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

This result also suggests that middle income countries tend to lose positions in the global value chain, possibly because of the increasing competition with low-income economies and outsourcing processes, as argued also by Cattaneo, Gereffi and Staritz (2010) and Eichengreen, Park and Shin (2013), who conjecture a “middle income trap”, since these countries are no longer competitive in standardized, labor-intensive commodities, but their productivity is too low to be able to compete in higher value added industries.

Notably, trade intensification had a positive effect on growth also in the long run, particularly for the middle group, suggesting that their shortfall in the short run might be temporary. It is worth to underline however that this analysis does not catch possible adverse permanent outcomes due to the hysteresis effect of short term relative losses. The financial openness had a positive and significant impact only in the short run on middle income countries being not statistically significant for the other two groups. This fact on the one side might ease the weaker convergence of middle income economies, but on the other side strengthens the position only of countries that are more active on the financial market, accentuating the relative loss of the others. In any case, in the long run, financial openness had only a negligible permanent effect on growth, suggesting that capital markets can sustain national growth but do not represent a permanent driving factor.

The terms of trade exert heterogeneous impacts on the three groups and over time. In the short run they have a negative impact on the OECD group as a whole, likely because their negative effect on price competition against the rest of the world. Particularly, the growth of middle income countries seems to be negatively affected by a raise of the relative prices of national product, confirming the difficult competitive position of those countries. However, in the long run gaining terms of trade seems to have fostered the growth in the OECD countries as a whole, possibly because the positive effect of market power and quality of goods prevail. Expectedly, this effect is significant in less developed countries but not within each group of OECD countries, thus it contributes to make the growth of advanced economies converge toward a common trend.

Public expenditure had a negative impact on per capita income growth. In the short run low income OECD members are particularly impaired by the weight of the government on the economy, while in the long run public consumption and investment seem to crowd out private expenditure especially in middle and high income countries. Apparently, interest paid on public debt hampered the overall growth of OECD members in the short run, but not within each of the three groups of countries, possibly because this payment ultimately redistributes income within the countries belonging to same club. In the long run, high income countries seem even to take advantage of this special item of the public expenditure, possibly because it raises national disposable income of households and corporations.

The return on education, approximated here by the value added per employed person with tertiary education, had a positive impact on per capita income on the whole sample and on high income countries both in the long and short run, and on middle income countries just in the long run. A possible reason is that the tertiary education produces a high return where there are suitable “infrastructures” to make it profitable.

Table 2 shows that trade openness decreased inequality (i.e.: negative effects on the Gini index) in low and middle income countries, both in the short and long run, but not in high income economies and not in the whole OECD sample.

Table 2 Estimates results: income convergence within countries

	OECD	low income*	middle income	high income
Short run effects				
D.trade_open	-0.0112 (0.00987)	-0.0536*** (0.0110)	-0.0426*** (0.0138)	0.00515 (0.0150)
D.fin_open	0.0136** (0.00685)	0.0207*** (0.00718)	0.0151 (0.00967)	0.0134 (0.0103)
D.ppe_GDP	-0.0207 (0.0141)	0.00586 (0.0185)	-0.0359 (0.0260)	-0.00716 (0.0175)
D.int_GDP	0.00333* (0.00176)	0.00372* (0.00214)	0.00703*** (0.00213)	0.00229 (0.00299)
D.lp_a	-0.00394 (0.00740)	0.0172* (0.00931)	0.0316** (0.0124)	-0.0193* (0.0105)
D.LS	0.0344 (0.0521)		-0.142* (0.0734)	0.196** (0.0759)
Long term effects				
L.lineq	-0.108*** (0.0202)	-0.0302 (0.0225)	-0.0711** (0.0307)	-0.132*** (0.0300)
L.trade_open	-0.00503 (0.00628)	-0.0263*** (0.00756)	-0.0312*** (0.00818)	0.00995 (0.00971)
L.fin_open	0.00840** (0.00335)	-0.00863** (0.00345)	-0.00740 (0.00630)	0.0118** (0.00460)
L.ppe_GDP	-0.0254** (0.0116)	0.0171 (0.0121)	-0.0462** (0.0207)	-0.00889 (0.0154)
L.int_GDP	0.00274** (0.00129)	0.00478*** (0.00164)	0.00747*** (0.00175)	-0.00198 (0.00202)
L.lp_a	0.00309 (0.00358)	-0.00215 (0.00434)	-8.12e-05 (0.00499)	-0.00506 (0.00675)
L.LS	0.00222 (0.0253)		-0.0152 (0.0375)	0.0557 (0.0389)
Constant	0.450*** (0.157)	0.0192 (0.0990)	0.458* (0.256)	0.205 (0.218)
Observations	368	209	135	212
R-squared	0.163	0.345	0.480	0.263
Number of cod	19	11	7	11
Country FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

* The coefficients of LS are not estimated for the first group of countries because too much data are missing for this variable.

This evidence is consistent with the stylised facts (see panel (c) of Chart 2) and with the literature on the effects of trade openness in less developed countries. In the latter trade worsens inequality because it improves primarily the value added only of few sectors or regions. On the opposite, in advanced economies, such as the OECD members, many sectors gain directly or indirectly from trade openness, which thus contributes to equalise incomes. Nevertheless, inequality becomes almost insensitive to the size of trade integration beyond a given threshold, possibly because the equalising effect of trade is compensated by the gains of few sectors on the frontiers of technology and at the top of value added chain.

Financial integration had negative impact on income disparities in the full OECD sample with diverging effects among the countries. The overall inequalising effect holds both in the short and long run and is likely related to the earnings of workers and entrepreneurs acting in the sector of financial services. However it seems that in the long term the financial integration reduced inequality in low income countries but the magnitude of the coefficient is very small.

In the short run, this outcome is stronger in low income countries, where the corresponding industry is less developed, although in the long term the gain tend to spread out to the other sectors, contributing to the equalization of incomes. Differently, in the richest OECD members financial openness contributed to worsen income distribution in the long run, when being on the frontier of financial innovation grants a permanent advantage to the financial industry.

Notably, the speed of convergence of the inequality to the corresponding long run relationship (i.e. the coefficient of $ineq_{t-1}$) is larger in high income countries, the inequalising long run impact of financial openness, that is the only statistically significant in the ECM component of the model, is dominating in this group of countries. Among the control variables, public expenditure net of interest on public debt seems to contribute to reduce inequality significantly only in the long run, and particularly in middle income OECD members. On the contrary, the rent provided by the interest on public debt worsened income distribution, particularly in low and middle income countries.

The role played by tertiary education is mixed. The value added per skilled worker had a negligible effect on inequality in the OECD as a whole and in the long run. However, in the short run lp_a worsened income distribution in low and middle income countries, while improving it in the richest OECD members. A tentative explanation is that skilled workers and hi-tech enterprises, who gain more than the average, are relatively few in less advanced countries, and are abundant in richest countries. Thus increasing their share of value added had adverse effects on income inequality in the first two group of countries, but not in the third.

The effect of the labour share on income inequality is apparently negligible for the OECD as a whole, also because its variability along the time is limited and the differences across the countries are quite stable. Also LS is not available for most low income countries. It turns out that the country and time dummies in the model likely capture most of the effect of LS on inequality. Nevertheless, increasing the labour share had positive effects on inequality in the middle income countries, as expected, and positive in the high income OECD members, that is less explicable.

4. Robustness check: the role of institutional quality and trade integration

In this paragraph we provide some robustness checks introducing in the original specification (see table 1 and 2) three additional regressors: i) an institutional variable on government effectiveness which refers to the capacity of a government to effectively formulate and implement sound policies, taken from the World Governance Indicators of the World Bank¹³, ii)

¹³ The WGI comprises six governance indicators. The first two (Voice and Accountability, and Political Stability and Absence of Violence/ Terrorism) relate to the process by which governments are selected, monitored and replaced. The second two indicators (Government Effectiveness and Regulatory Quality) refer to the capacity of a government to effectively formulate and implement sound policies. The last two indicators (Rule of Law and Control of Corruption) concern the respect of citizens and the State for

a euro dummy proxing a full trade integration among a group of countries within the OECD. We selected the EMU as the form of tightest trade agreement since the OECD members already constitute a very well integrated market and iii) a dummy proxing the global financial crisis occurred in 2008.

Table 3 - Institutional quality, trade integration and income convergence between countries

	OECD	low income*	middle income	high income
Short run effects				
D.trade_open	0.0976*** (0.0147)	0.258*** (0.0813)	0.0557** (0.0240)	0.0941*** (0.0300)
D.government effectiveness	-0.00868 (0.00889)	0.0244 (0.0273)	0.00356 (0.0142)	-0.00496 (0.0209)
euro	-0.00499 (0.00405)	0.0156 (0.0141)	-0.00362 (0.0145)	-0.00668 (0.00616)
D.trade*euro	-0.00829 (0.00876)	-0.0417 (0.0404)	-0.00824 (0.0224)	0.0252* (0.0131)
D.trade*gov	-0.0445*** (0.0123)	-0.0320 (0.0690)	-0.0182 (0.0213)	-0.0309 (0.0365)
Long run effects				
L.trade_open	0.0788*** (0.0109)	0.263*** (0.0553)	0.0722*** (0.0204)	0.0654** (0.0255)
L. government effectiveness	-0.00961 (0.00785)	0.106*** (0.0258)	-0.00694 (0.0145)	0.00228 (0.0216)
L.trade*euro	0.00242 (0.00656)	-0.0160 (0.0497)	0.0165 (0.0250)	0.0194 (0.0121)
L.trade*gov	-0.0536*** (0.0117)	-0.111 (0.101)	-0.0267 (0.0251)	-0.0828** (0.0379)
Crisis_2008	-0.0233*** (0.00580)	0.00809 (0.0303)	-0.0355*** (0.0101)	-0.0240*** (0.00730)
Observations	470	61	202	207
R-squared	0.730	0.971	0.721	0.803
Number of cod	26	4	11	11
Country FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

For what concerns the institutional quality indicator, in interpreting the analysis we need to take into account all the caveats associated with the use of signals coming from qualitative survey indicators. We also tested the explanatory capacity of the expenditure in R&D as percentage of GDP but this regressor was not statistically significant, probably because investment in R&D has very long run returns that are hard captured by the few lags that can be practically introduced in our sample. We also included in our regressions interaction terms between trade openness and governments effectiveness and trade openness and the euro regressors. With the inclusion of these terms the estimated parameters indicate how the coefficient of the original variables change

the institutions that govern economic and social interactions among them. These aggregate indicators combine the views of a large number of enterprises, citizens and expert survey respondents in industrial and developing countries. They are based on over 30 individual data sources produced by a variety of survey institutes, think tanks, non-governmental organizations, international organizations, and private sector firms. Estimates of governance ranges from approximately -2.5 (weak) to 2.5 (strong) performance. For a full methodological explanation see Kaufmann, Kraay and Mastruzzi (2010).

as the interacted variable increases (or is 1 in the case of the euro dummy). Notably, the baseline model estimates proved to be robust to the inclusion of euro agreement, institutional quality and interactions (see tables A3 and A4 in the Appendix) further strengthening the evidence provided by the baseline model.

The estimates show that the only group benefiting from the introduction of the single currency was that of high income countries while the middle income group suffered a negative effect. The interaction of the euro dummy with trade openness affected negatively in the short run and long run middle income countries reinforcing the previous result. Moreover, belonging to the EMU seems also to worsen the inequalising effect of trade, particularly in middle income countries. The concentration of negative impacts deriving from trade integration in middle income countries might be related to the prevalence of a trade diversion effects over the trade creation possibly because in the group only five countries over 12 are EMU members (see De Nardis et al 2008 a and b).

Table 4 - Institutional quality, trade integration and income convergence within countries

	OECD	low income*	middle income	high income
Short run effects				
D.trade_open	-0.0170* (0.0100)	-0.0157 (0.0174)	-0.0268** (0.0122)	-0.0288 (0.0197)
D.government effectiveness	0.00519 (0.00634)	-0.0160** (0.00631)	0.00204 (0.00681)	-0.000670 (0.0137)
euro	0.00299 (0.00282)	0.000269 (0.00401)	-0.0120* (0.00715)	0.0108** (0.00445)
D.trade*euro	0.00290 (0.00513)	0.0126 (0.00827)	-0.0242** (0.0101)	-0.00261 (0.00849)
D.trade*gov	0.0215** (0.0100)	-0.0206 (0.0155)	0.0189* (0.0108)	0.0475* (0.0261)
Long run effects				
L.trade_open	-0.00617 (0.00679)	-0.0446** (0.0210)	-0.0165* (0.00987)	-0.0271 (0.0194)
L. government effectiveness	0.0116* (0.00601)	-0.0124** (0.00567)	0.0110 (0.00787)	0.0286** (0.0144)
L.trade_euro	-0.00488 (0.00389)	0.0161 (0.0112)	-0.0314*** (0.0114)	-0.0161** (0.00778)
L.trade*gov	0.0310*** (0.00777)	-0.0479* (0.0246)	0.0194* (0.0115)	0.0581* (0.0296)
Crisis 2008		-0.0111* (0.00812)	0.0194** (0.00673)	-0.00113 (0.00567)
Observations	335	58	121	195
R-squared	0.226	0.947	0.660	0.362
Number of cod	19	4	7	11
Country FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

The government effectiveness had a positive impact on growth only in the long run and in the middle income countries. As for the interaction of the latter with trade openness the coefficient indicates that it reduced the advantages of trade for the OECD area as whole, particularly in the

long run and for high income countries. One possible explanation relies on the fact that the effective implementation of provisions on environment protection and product quality might have reduced trade profits margin and consequently returns on income per capita.

The EMU membership proved to reduce inequality in middle income countries and to increase it in high income countries. While if interacted with trade openness it decreased inequality in short and long run in middle and high income countries.

As expected, the government effectiveness in low income countries, decreased inequality in short and long run. While in the long run the quality of institutions have worsened the inequality in high income countries. The interaction with trade openness on inequality confirmed these results. One possible explanation is that in high income countries governments implemented policies that favored efficiency over equity while the opposite occurred in low income countries. In any case, our model is admittedly too simplified to draw robust conclusions and this issue need a further and deeper investigation.

Eventually the global financial crisis affected negatively the income per capita in all the three groups of countries and inequality only in low income countries.

Concluding remarks and policy implications

The evidence presented in this paper indicates that in OECD countries, trade and financial openness exerted heterogeneous impacts on per capita GDP and income inequality especially once considering separately their short and long terms effects.

Estimates results show that trade openness in the past two decades had a positive impact on all OECD countries but improved mostly the GDP per capita of low income countries, consistently with the catching up hypothesis. It also decreased inequality in low and middle income countries in the short run, and in low and middle income countries also in the long term, although to a different extent.

As for financial openness it had a positive and significant impact on growth for the OECD area as a whole, and particularly in the middle income countries, but only in the short run. Also it increased income inequality, but with sharp differences among the three groups of countries. It worsened income distribution in low income economies in the short term, but not in the long run, and widened income disparities in high income countries only in the long run.

Public spending was counterproductive for growth but improved income distribution in the long run, especially in middle and high income countries. Nevertheless, the payment of interests on public debt hampers growth in the short run and worsens income distribution, although with different intensity between the three groups of countries. Thus our results suggest fiscal consolidation might contribute to reduce income inequality as long as it cuts the amount of interest paid on the public debt.

Government effectiveness positively affects the low income group. If we consider the interaction between the government effectiveness and trade openness it seems that in the long run and in the

high income group of countries higher government effectiveness had a negative impact on income per capita. One possible explanation rely on the fact that the effective implementation of provisions on environmental protection and product quality, that characterised the past two decades in the OECD, might have reduced overall trade profits margins and consequently returns on income per capita. As expected, the government effectiveness in low income countries, decreased inequality in short and long run. While in the long run the quality of institutions have worsened the inequality in high income countries. The interaction with trade openness on inequality confirmed these results. One possible explanation is that in high income countries governments implemented policies that favored efficiency over equity while the opposite occurred in low income countries.

The euro membership when interacted with the trade openness proved to have affected negatively the middle income countries and to have benefited only the high income group. As for inequality, the euro membership had an heterogeneous impact, it decreased inequality in middle income group and increased it in the high income group. However, when interacted with the trade openness in the short run decreased the inequality in the middle income countries and in the long run in both middle and high income countries.

All in all, our results suggest that given the very high heterogeneity of trade and financial integration effects even in the fairly homogeneous OECD group of countries, implementing “one size fits all” policies is a wrong strategy. Only a more comprehensive and coherent set of trade, domestic and international policies might achieve that global trade and finance contribute to reduce disparities between and within countries and to foster a sustainable growth in the long term.

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APPENDIX

Table A1: Data description

<i>Trade openness</i>	<i>(Exports +Imports)/GDPT-1</i>	<i>Source: OECD</i>
<i>GDP per capita</i>	<i>Levels, constat</i>	<i>Source: OECD and IMF</i>
<i>Population</i>	<i>Levels</i>	<i>Source: World Bank</i>
<i>Terms of trade</i>	<i>(export value/export volume)/(import value /import volume)</i>	<i>Source: OECD</i>
<i>Financial openness</i>	<i>Net foreign assets+ liabilities (NFA+NFL)/GDPT-1.</i>	<i>Source: EWNII Milesi Ferretti (2017)</i>
<i>R&D expenditure</i>	<i>% of GDP</i>	<i>Source: OECD</i>
<i>Government effectiveness</i>	<i>Government effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. The index is based on over 30 individual data sources produced by a variety of survey institutes, think tanks, non-governmental organizations, international organizations, and private sector firms. Estimate of governance ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance. For a full methodological explanation see Kaufmann, Kraay and Mastruzzi (2010).</i>	<i>Source: World Bank WGI</i>
<i>Public expenditure</i>		<i>Source: OECD</i>
<i>Interests on public debt</i>		<i>Source: OECD</i>
<i>Gini index</i>		<i>Source: Standardized World Income Inequality Database, Solt (2016)</i>
<i>Value added per worker with tertiary education</i>		<i>Elaboration on ILO and OECD databases</i>
<i>Labour share</i>	<i>(Compensation of employees corrected for self-employed)/(Nominal Value added at factors' cost)</i>	<i>Source: OECD</i>

Tab A2 Descriptive statistics

VARIABLES	N	mean	standard dev	min	max
debt_GDP	845	57.63	38.29	3.664	242.1
eu	888	0.377	0.485	0	1
euro	888	0.235	0.424	0	1
fin_open	808	10.15	37.80	0.410	333.8
GDP_k	886	11.34	24.83	0.0900	187.8
GDP_pck	886	33,086	14,893	8,066	99,515
gfi	800	3.120e+12	3.632e+13	678,105	4.872e+14
gini_disp	789	31.63	6.709	20.30	52.30
gini_mkt	789	47.41	5.358	29	62
goveff	735	1.328	0.573	-0.265	2.354
infla	884	6.501	70.24	-1.676	2,076
int_GDP	838	2.079	2.238	-2.965	16.38
k_pc	453	14.47	13.55	0.427	62.86
lp	738	0.773	0.364	0.105	2.087
lp_a	690	0.0285	0.0147	0.00230	0.0954
nfa	764	-85,078	739,199	-7.597e+06	3.420e+06
pe_GDP	853	41.59	9.025	14.24	65.69
ppe_GDP	838	39.55	8.821	13.79	63.73
r_d	792	9.104e+11	2.004e+13	-5.929e+07	5.510e+14
rulaw	735	1.283	0.610	-0.727	2.100
teratt	668	26.92	10.28	7.011	56.27
terms_trade	841	0.989	0.122	0.499	1.614
trade_open	847	0.922	0.567	0.146	4.134

Table A3 - Institutional quality, trade integration and income convergence between countries

	OECD	low income*	middle income	high income
D.trade_open	0.0976*** (0.0147)	0.258*** (0.0813)	0.0557** (0.0240)	0.0941*** (0.0300)
D.fin_open	0.0142* (0.00802)	-0.0324 (0.0505)	0.0139 (0.0103)	-0.00432 (0.0139)
D.terms_trade	-0.0418 (0.0302)	-0.419* (0.218)	-0.0858 (0.0531)	-0.0309 (0.0396)
D.ppe_GDP	-0.153*** (0.0201)	-0.164* (0.0807)	-0.143*** (0.0378)	-0.158*** (0.0227)
D.int_GDP	-0.00655** (0.00282)	-0.0234 (0.0164)	-0.00315 (0.00438)	-0.00393 (0.00456)
D.lp_a	0.0251** (0.0111)	-0.0620 (0.0422)	0.0207 (0.0207)	0.0374** (0.0159)
D.gov	-0.00868 (0.00889)	0.0244 (0.0273)	0.00356 (0.0142)	-0.00496 (0.0209)
deu	-0.00499 (0.00405)	0.0156 (0.0141)	-0.00362 (0.0145)	-0.00668 (0.00616)
D.trade_eu	-0.00829 (0.00876)	-0.0417 (0.0404)	-0.00824 (0.0224)	0.0252* (0.0131)
D.trade_gov	-0.0445*** (0.0123)	-0.0320 (0.0690)	-0.0182 (0.0213)	-0.0309 (0.0365)
L.GDP_pck	-0.112*** (0.0162)	-0.262*** (0.0642)	-0.0898*** (0.0303)	-0.145*** (0.0326)
L.trade_open	0.0788*** (0.0109)	0.263*** (0.0553)	0.0722*** (0.0204)	0.0654** (0.0255)
L.fin_open	0.00624 (0.00479)	0.0172 (0.0459)	8.89e-05 (0.00659)	0.00242 (0.00780)
L.terms_trade	0.0398*** (0.0132)	-0.377 (0.271)	0.0441 (0.0296)	0.0194 (0.0154)
L.ppe_GDP	-0.109*** (0.0162)	-0.0429 (0.0999)	-0.135*** (0.0285)	-0.125*** (0.0208)
L.int_GDP	0.00272 (0.00191)	-0.0271 (0.0215)	0.00116 (0.00349)	0.00982*** (0.00288)
L.lp_a	0.0217*** (0.00598)	-0.0376 (0.0402)	0.0164 (0.0105)	0.0281*** (0.00989)
L.gov	-0.00961 (0.00785)	0.106*** (0.0258)	-0.00694 (0.0145)	0.00228 (0.0216)
L.trade_eu	0.00242 (0.00656)	-0.0160 (0.0497)	0.0165 (0.0250)	0.0194 (0.0121)
L.trade_gov	-0.0536*** (0.0117)	-0.111 (0.101)	-0.0267 (0.0251)	-0.0828** (0.0379)
Crisis_2008	-0.0233*** (0.00580)	0.00809 (0.0303)	-0.0355*** (0.0101)	-0.0240*** (0.00730)
Constant	1.695*** (0.193)	2.609*** (0.858)	1.564*** (0.349)	2.125*** (0.390)
Observations	470	61	202	207
R-squared	0.730	0.971	0.721	0.803

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1, the estimates controls for country and year FE

Table A4 - Institutional quality, trade integration and income convergence within countries

	OECD	low income*	middle income	high income
D.trade_open	-0.0170* (0.0100)	-0.0157 (0.0174)	-0.0268** (0.0122)	-0.0288 (0.0197)
D.fin_open	0.0102 (0.00675)	0.00805 (0.0114)	0.00493 (0.00861)	0.0109 (0.00977)
D.ppe_GDP	-0.0220* (0.0133)	-0.0329** (0.0157)	-0.0217 (0.0221)	-0.0101 (0.0169)
D.int_GDP	0.00225 (0.00162)	-0.000148 (0.00314)	0.00277 (0.00180)	0.00254 (0.00270)
D.lp_a	-0.00246 (0.00705)	0.0149* (0.00777)	0.0403*** (0.0108)	-0.0256** (0.0102)
D.LS	0.0287 (0.0507)		-0.159** (0.0640)	0.201*** (0.0752)
D.gov	0.00519 (0.00634)	-0.0160** (0.00631)	0.00204 (0.00681)	-0.000670 (0.0137)
deu	0.00299 (0.00282)	0.000269 (0.00401)	-0.0120* (0.00715)	0.0108** (0.00445)
D.trade_eu	0.00290 (0.00513)	0.0126 (0.00827)	-0.0242** (0.0101)	-0.00261 (0.00849)
D.trade_gov	0.0215** (0.0100)	-0.0206 (0.0155)	0.0189* (0.0108)	0.0475* (0.0261)
L.lineq	-0.116*** (0.0219)	-0.250** (0.112)	-0.0719** (0.0319)	-0.179*** (0.0343)
L.trade_open	-0.00617 (0.00679)	-0.0446** (0.0210)	-0.0165* (0.00987)	-0.0271 (0.0194)
L.fin_open	0.00265 (0.00411)	0.0127 (0.0148)	-0.0122* (0.00707)	0.00971* (0.00538)
L.ppe_GDP	-0.00954 (0.0120)	-0.0302* (0.0150)	-0.0403** (0.0202)	0.0104 (0.0163)
L.int_GDP	0.00131 (0.00122)	-0.000950 (0.00414)	0.00465*** (0.00153)	-0.00229 (0.00195)
L.lp_a	0.00592 (0.00387)	0.0149** (0.00540)	0.00481 (0.00497)	-0.0153** (0.00707)
L.LS	-0.0371 (0.0267)		-0.0854** (0.0350)	0.0504 (0.0425)
L.gov	0.0116* (0.00601)	-0.0124** (0.00567)	0.0110 (0.00787)	0.0286** (0.0144)
L.trade_eu	-0.00488 (0.00389)	0.0161 (0.0112)	-0.0314*** (0.0114)	-0.0161** (0.00778)
L.trade_gov	0.0310*** (0.00777)	-0.0479* (0.0246)	0.0194* (0.0115)	0.0581* (0.0296)
2008.year		-0.0111* (0.00812)	0.0194** (0.00673)	-0.00113 (0.00567)
Constant	0.598*** (0.165)	1.039** (0.383)	0.774*** (0.243)	0.261 (0.230)
Observations	335	58	121	195
R-squared	0.226	0.947	0.660	0.362

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1, the estimates controls for country and year FE