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**Globalization and Inequality in  
Advanced Economies: A  
Provisional Assessment**

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## **Abstract**

*We review the channels through which the different dimensions of globalization and their interactions impact inequality in advanced economies. North-South trade of final goods, of intermediate goods and of tasks (offshoring) and the interplay between trade and technology generate winners (high skilled workers and capital owners) and losers (low and medium skilled workers) and raises inequality. To make everyone win, a share of the winners' gain should be redistributed to the losers. But the increasing international mobility of the winners and of the tax bases they own (capital and high incomes) generates tax competition and a race to the bottom of the related tax rates. This tends to reduce the existing social transfers but it also hinders the redistribution necessary to offset trade-driven inequality. In addition, globalization (i) modifies anti-inequality policies by producing an inequality-unemployment tradeoff and a redistribution-progressivity tradeoff, and (ii) fosters public debt and/or over-taxation of the middle class if the governments compensate the increase in social risks, generating a middle class curse and a social democracy curse. It can also hamper skill upgrading which is a major means to fight growing inequality in the longer term. Finally, (i) partial approaches and estimates which do not encompass the diverse interactions highlighted here could reveal to be misleading and (ii) combating globalization-related inequality should focus on tax and social rules avoidance rather than on trade restrictions.*

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*We review the channels through which the different dimensions of globalization and their interactions impact inequality in advanced economies. North-South trade of final goods, of intermediate goods and of tasks (offshoring) and the interplay between trade and technology generate winners (high skilled workers and capital owners) and losers (low and medium skilled workers) and raises inequality. To make everyone win, a share of the winners' gain should be redistributed to the losers. But the increasing international mobility of the winners and of the tax bases they own (capital and high incomes) generates tax competition and a race to the bottom of the related tax rates. This tends to reduce the existing social transfers but it also hinders the redistribution necessary to offset trade-driven inequality. In addition, globalization (i) modifies anti-inequality policies by producing an inequality-unemployment tradeoff and a redistribution-progressivity tradeoff, and (ii) fosters public debt and/or over-taxation of the middle class if the governments compensate the increase in social risks, generating a middle class curse and a social democracy curse. It can also hamper skill upgrading which is a major means to fight growing inequality in the longer term. Finally, (i) partial approaches and estimates which do not encompass the diverse interactions highlighted here could reveal to be misleading and (ii) combating globalization-related inequality should focus on tax and social rules avoidance rather than on trade restrictions.*

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## 1. Introduction

Over the last forty years, advanced countries (the North) as well as emerging countries (the South) have become increasingly globalised, and this move has covered a large range of dimensions: trade, factor mobility, multinationalization of firms, offshoring and global value chains, technological transfers, financial flows, mobility of tax bases and migrations. In addition, inequality has substantially increased in all advanced economies, erasing the equality gains of the post 1929 crisis and the post-World War II period.

Based on the concomitance of both developments, an abundant economic literature has explored the possible causality between globalisation on the one hand and inequality in advanced economies on the other hand. As the Heckscher–Ohlin approach determines winners and losers in international trade based on countries' factor endowments, a first strand of studies has attempted to measure the impact of trade, particularly North-South trade, on the observed growing inequality between high skilled and low skilled wages in the North. The early empirical works made in the nineties with data from the 70s, 80s and early 90s, i.e. when China's exports remained rather low, showed a limited impact of trade on inequality. The subsequent works have revealed a more weighty influence, particularly when focusing on offshoring and international value chains which are typically linked to FDI, technological transfers and multinationalization of firms. But globalization has several additional key dimensions. The decrease in mobility costs of capital and individuals has fostered tax bases mobility and generated a globalised market for the highest skills and the most talented workers. The mobility of tax bases has led to tax competition, constrained social policies and labour market institutions and jeopardised redistribution. The high mobility of talented workers has magnified the return to talent. All those developments and the related mechanisms should be considered when assessing the impacts of globalization on growing inequality in advanced economies.

The aim of this paper is to combine those different dimensions and the related literature to propose a general assessment of the globalization-inequality nexus within advanced economies. This assessment can only be provisional since globalization is by nature a dynamic process.

The general diagnosis exposed in the paper is the following.

First, the development of trade between advanced and emerging countries (henceforth North-South Trade, NST) has raised inequality between high and low skilled workers in the North by displacing the unskilled-intensive sectors, production stages and tasks to the South.

Concurrently, North-South openness has made capital to be scarcer in the globalised economy because capital was relatively scarce in the South. This has increased capital return. In this pattern, high skilled workers and capital owners are the winners and low and medium skilled workers the losers, and the latter are all the more hurt as they account for a large share of one country's working population. Nevertheless, NST could have increased the total and average real income in the North provided that full employment had been preserved. In this case, a simple way to make North-South trade profitable for all workers (Pareto-optimal) consists in transferring to the losers a share of the winners' gain so that everyone wins or, at least, nobody loses.

Second, globalisation is characterised by a large international mobility of capital and of highly skilled and talented workers, generating corporate tax competition and income tax competition for the high incomes and leading to a race to the bottom of the related levies. This firstly hampers the existing redistribution by reducing the taxes paid by the rich (capital owners and high earnings) and the transfers to the low and middle incomes. In addition, it impedes the redistribution scheme necessary to offset the increase in inequality generated by North-South trade. Finally, the high mobility of talented workers has generated a world market for talents. This has concentrated the return to talent on a limited number of persons, increased thereby inequality at the top of the income ladder, and created a globalised elite which has to a large extent broken its national ties.

Third, facing the increase in inequality, governments in the North can adopt two possible strategies. They can firstly 'let the market do' which results in a sizeable increase in inequality. They can secondly try to compensate, at least partially, the negative impact of globalisation on the less skilled, which supposes in the short term public transfers to low incomes. Since tax competition prevents making the winners pay, the cost of 'compensation' should be financed, either by non-mobile tax bases, which essentially hurts the middle class, or by public debt, which is typically not sustainable in the long term. In addition, if labour market institutions prevent the decrease in unskilled wages, the economy can experience growing unemployment of less skilled. In the longer term, the reduction in inequality can only be reached by a reduction in the quantity of 'losing' factors, i.e., low and medium skilled workers. This requires additional efforts on education which can be hindered by both growing inequality and the cut in taxes.

Given the very large scope of the subject, we do not provide an extensive survey of the different dimensions of the globalization-inequality nexus. We rather expose the major mechanisms of each dimension and the ways they are linked and they interact. We mention

the seminal and major analyses, and we refer to existing surveys for more precise presentations of the literature.

The paper is organised as follows. In Section 2, we put forward the developments observed over the last forty years which determine the subsequent analyses. Section 3 exposes the analyses and literature related to the different aspects of the trade–inequality nexus in advanced countries. Section 4 examines the analyses and literature on tax bases mobility and tax competition and their implications for the winners and losers of globalization. In both preceding sections, basic models of the operating mechanisms are exposed. Section 5 briefly depicts the impact of globalization on the strategies and policies adopted by governments to respond to growing inequality. We highlight the consequences of our diagnosis for the analysis of the globalization–inequality nexus and we conclude in section 6.

## **2. Observed developments**

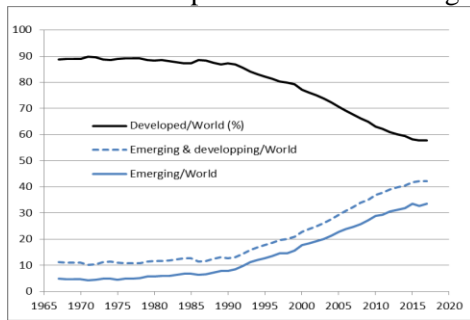
In this section, we highlight several key developments on which we can lean to analyse the globalization-inequality nexus.

### **2.1. Trade, offshoring, FDI and inequality**

Since the early nineties, the world trade has grown more rapidly than the world production. But the key change concerns the structure of trade. First, the weight of emerging countries, particularly China, has substantially increased to the detriment of advanced economies in the production and exports of manufacturing (Fig. 1). Second, trade of intermediate goods and the international distribution of stages and tasks for the production of goods has risen more rapidly than total trade (Fig. 2). Finally, FDI has considerably increased at the World level (Fig.3), with the growing investments of northern multinationals in emerging countries. This has permitted large technological transfers to the South.

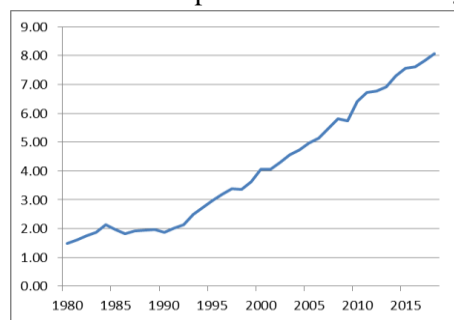
As regards inequality, all indicators show a significant increase since the eighties in almost all advanced economies, even if the phasing and intensity of those rises differ across countries, as shown by Fig. 4 which depicts the variation of the post redistribution Gini coefficient for earnings. It should finally be noted (i) that the rise in the share of top incomes (top 1%, top 0.1%) has significantly contributed to the increase in inequality (Atkinson et al, 2011) and (ii) that this increase has been particularly sizeable in the US, and to a lesser extent, non-US Anglo-Saxon and Nordic countries.

**Fig.1.** Weight of each area (%) in the World exports of manufacturing

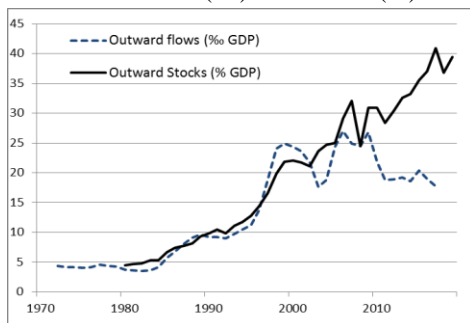


Source: CEPII, CHELEM Database.

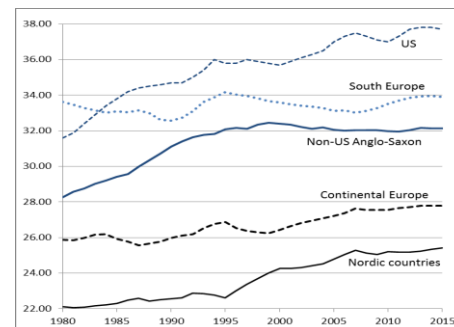
**Fig. 2.** Intermediate goods from the South in the North total imports of Manufacturing (%)



**Fig. 3.** FDI/GDP at the World level: Outward flows (%) and Stocks (%)



**Fig. 4.** Post-redistribution earnings inequality (Gini)



Notes: Fig. 4: Source WIID, 2016. Non-weighted average. Continental Europe: Austria, Belgium, France, Germany, Netherlands. Non-US Anglo-Saxon: Australia, Canada, Ireland, New Zealand, UK. Nordic countries: Denmark, Finland, Norway, Sweden. South Europe: Greece, Italy, Portugal, Spain.

## 2.2. Mobility of tax bases, race to the bottom and decrease in tax progressivity

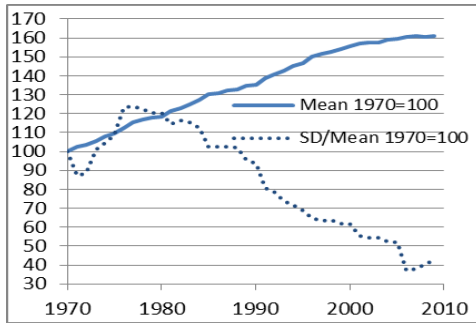
The growing mobility of both physical and financial capital since the early nineties is well documented. Capital mobility is now almost perfect across advanced countries. As regards the mobility of persons, it is typically linked to the cost of migrating and living abroad. There is no direct measure of this cost, but it can be approached by the KOF index of social globalization.<sup>1</sup> Fig. 5 clearly shows that social globalization has significantly and continuously risen since the early seventies, which reveals a substantial decrease in personal migration costs. In addition, the inter-country deviation (ratio of the index standard deviation to its mean) has also substantially decreased since the early eighties, which shows that this move is not only general, but it is also larger in the initially less open countries.

The growing mobility of tax bases has come with a substantial decrease in the corporate tax rates and in top marginal income tax rates. Figs. 6 and 7 show a large decrease in the

<sup>1</sup> This index combines three components: (i) personal contacts, measuring the personal interactions between one country and abroad (telecom traffic, journeys, number of immigrants, number of letters), (ii) information flows of information between one country and other countries, and (iii) cultural proximity denoting the openness of the population to international cultural standards. It is clear that the rise in those components leads to both lower monetary cost and lower cultural and psychological costs of migrating and living abroad.

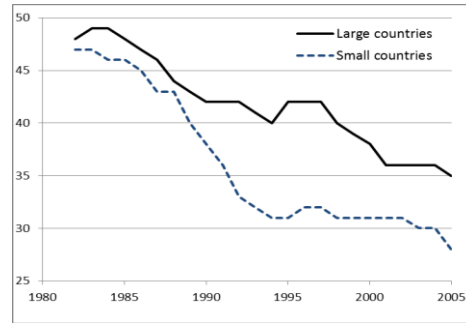
eighties and early nineties of the tax rates and a continuous decrease since the nineties of their deviation across countries. Finally, the loss in levies due to the decreases in the corporate and marginal income tax rates have been at least partially offset by an increase in taxes on consumption (Fig. 8) and an increase in public liabilities.

**Fig. 5.** KOF index of *Social* globalization\*



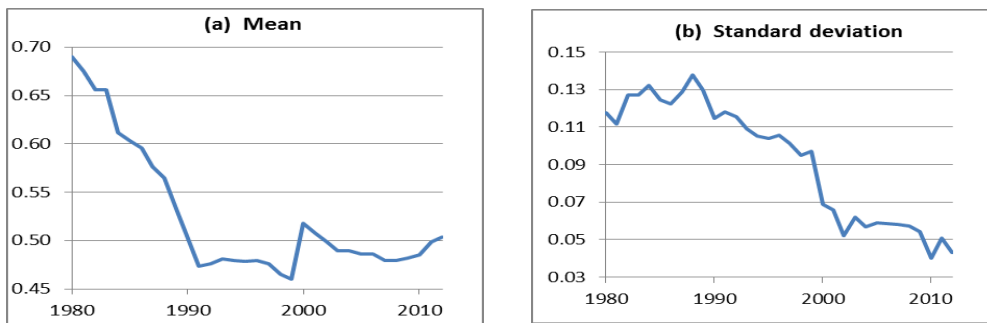
\* Advanced countries

**Fig. 6.** Average Corporate Tax rate



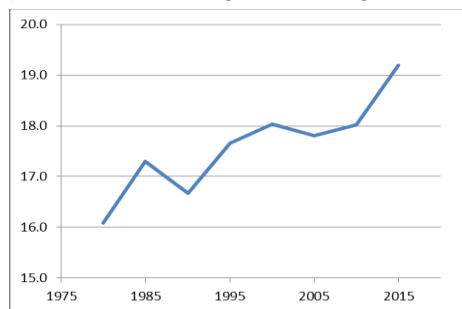
Source: Takahashi & al. (2013), Table1. p.223.

**Fig. 7.** Advanced countries: Top marginal income tax rates, 1980-2012



Source: OECD.

**Fig 8.** OECD Unweighted average VAT rate



Source: OECD, Consumption Tax trends 2016. Chap. 2.

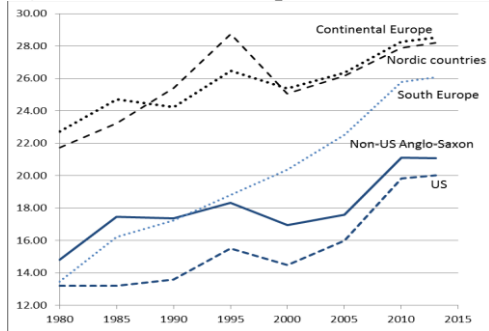
### 2.3. Public social expenditure and public debt

Since 1990, globalization has come with a quasi-continuous increase in social public expenditures as a percentage of GDP (Fig. 9). Social public expenditure can be seen as an indicator of the compensation effect (compensation of the social risks linked to globalization). However, it is clear from Figs. 10 and 4 that those increases have not been sufficient to augment relative redistribution and prevent the rise in inequality.

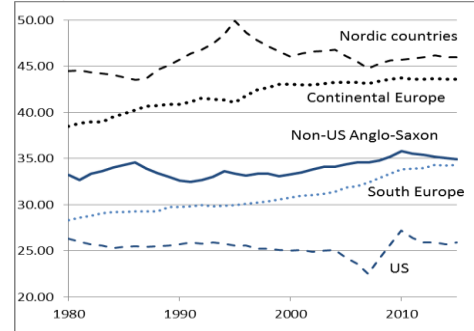


Finally, since the eighties, the increase in public expenditures has been essentially funded by public liabilities (see Genschel, 2002, Fig. 1, p. 248).

**Fig. 9.** Social Public expenditure (% GDP)



**Fig.10.** Relative redistribution rate

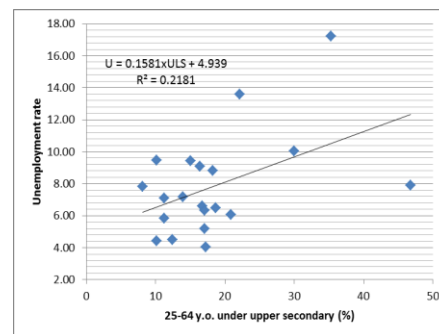
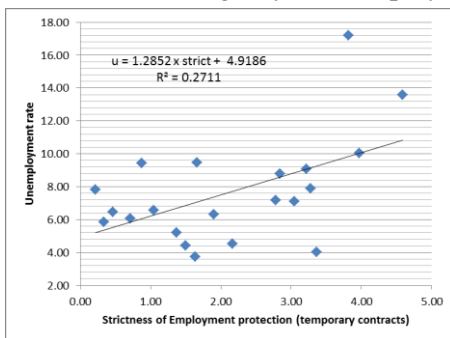


Source: Fig. 9: OECD Stat. Fig. 10: WIID, 2016. See the notes under Fig.4 for the calculations and composition of each country group.  $Relative\ redistribution\ rate = \frac{pre - tax \ \& \ redist.\ Gini - post - tax \ \& \ redist.\ Gini}{pre - tax \ \& \ redist.\ Gini}$ .

#### 2.4. Labour market rigidity, skill endowment and unemployment

In the last thirty years, labour market rigidity, particularly for temporary contracts, and the endowments in low skilled labour appear to be key factors of the differences in unemployment across advanced economies (Figs. 11–12).

**Fig. 11.** Labour market rigidity & unemployment **Fig.12.** Unskilled labour force & unemployment



Note: Each point depicts a country and the variables are represented by their mean in the period 1990-2019.

The positive relationship between low skill endowment and unemployment is not surprising provided that low skilled workers are the main component of unemployment in advanced economies. It must be highlighted that the share of unskilled workers in total unemployment has grown despite the substantial decline in their share in the working population of advanced economies.

In summary the present wave of globalization broadly begun in the early nineties. It corresponds to the openness to trade and FDI inflows of China and South-East Asia and to the fall of communism in Eastern Europe and Russia. The whole world now belongs to the

globalised market. Globalization is connected to the large decrease in the mobility costs of goods, physical and financial capital, high skilled and talented workers, and rich people. It is essentially characterised by (i) the substantial increase in the weight of emerging countries in trade of manufacturing, (ii) the huge rise in FDI from the North to the South which has permitted large technological transfers, (iii) the extension of global value chains through the offshoring of production stages and tasks, and (iv) the large mobility of tax bases for capital, wealth, high income earners and rich people. In all advanced economies, it has come with (i) a significant increase in inequality, (ii) a significant decrease in the taxation of capital and in the marginal income and inheritance tax rates, (iii) an increase in public social expenditure and public debt and (iv) an increase in unemployment of the low skilled which is all the larger as labour market flexibility is low and the share of unskilled workers in the labour force is high.

### **3. Trade and inequality**

The impact of trade on inequality has generated a large theoretical and empirical economic literature. Most of the surveys reviewing the relationship between globalization and inequality are centred on trade in its different dimensions: trade in merchandise, in intermediate inputs and tasks (offshoring) and in services.<sup>2</sup> In these presentations, FDI and technological transfers essentially act through the multinationalization of firms and the related increase in offshoring and intra-firm trade.

We make here a distinction between North-South trade in final goods based on comparative advantages between advanced and emerging countries, trade in intermediate goods and in production stages and tasks which define offshoring and global value chains, and finally trade and technology interplays.

The impact of trade in final goods between advanced economies is not treated because (i) most of the increase in North-North trade occurred before the present wave of globalization which begun in the early nineties, and (ii) its weight in the explanation of rising inequality in the North is secondary compared to the three aforementioned channels.

#### **3.1. Comparative advantage, North-South trade and inequality**

In the early nineties, the analysis of the impact of trade upon growing inequality firstly focused on trade of final goods based on the distribution of factoral comparative advantages

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<sup>2</sup> See, e.g., Chusseau et al. (2008), Pavcnik (2011), Kurokawa (2014), Helpman (2018).

between advanced and emerging countries. The natural framework to model this impact was the Heckscher-Ohlin-Stolper-Samuelson approach with two factors (high skilled and low skilled labour), two goods (one skill intensive and the other low skill intensive) and two countries (the North comparatively well-endowed with high skill, and the South with low skill). At the free trade equilibrium, the Stolper-Samuelson effect predicts an increase the skill premium (the ratio of skilled to unskilled wage which measures inequality in this model) in the North and a decrease in the South. When skill relative endowments are sufficiently divergent between the North and the South, which was the case in the nineties and is still now, both countries are not inside the diversification cone<sup>3</sup> and inequality is magnified in the North. When assuming a growing size of the South, it can be shown that, during a first phase of globalization, the North experiences rising inequality and a decrease in the real wage of low skilled workers (Hellier, 2019). Finally, when extending the model by assuming several advanced countries with different skill endowments, the hierarchy of inequality across Northern countries is the inverse of the hierarchy in skill endowments once the unskilled intensive sector has been relocated in the South (Hellier & Chusseau, 2008; Hellier, 2013a).

The North-South H-O-S model predictions are at odds with a large range of observed developments (see the comprehensive list in: Hellier, 2013, p. 113). Several extensions of the basic model permit to erase most of those shortcomings (Hellier, 2013). In particular, efficiency wage behaviours and labour market imperfections generate unemployment in the North and reveal an inequality-unemployment tradeoff (see section 5.1. hereafter). However, by assuming exogenous and given technology and no segmentation in production, the traditional HOS framework does not integrate offshoring and fails to analyse trade and technology interplay.

### **3.2. Offshoring and global value chains**

Offshoring consists in locating in different countries the different stages and tasks in the production of goods and services. The between-country distribution of value chains aims at minimising the cost of production. The development of trade in segments and tasks is a major characteristic of the present globalisation process and the literature on the impacts of offshoring on labour markets and inequality is extremely large.

Baldwin (2006) distinguishes two ways of considering and modelling offshoring. The ‘Mankiw offshoring’ (Mankiw & Swagel, 2006) concerns production stages or intermediate

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<sup>3</sup> The diversification cone is the interval of skill intensities in the productions of the two goods (skill-intensive and unskilled labour intensive) corresponding to the World skill premium with factor price equalisation.

goods and can be modelled by replacing final goods by intermediate goods within a comparative advantage framework. The ‘Grossman–Rossi-Hansberg Offshoring’ (Grossmann & Rossi-Hansberg, 2008) focuses on trade of individual tasks.

To simply analyse the impact of Mankiw offshoring, consider a basic North-South HOS model. Offshoring makes the model move from a  $2 \times 2 \times 2$  (2 factors, 2 goods, 2 countries) approach to a  $2 \times 2 \times 2 \times 2$  (2 factors, 2 segments, 2 sectors, 2 countries) framework. Then, trade in final goods is just replaced by trade in segments and each country is specialised in the segment for which it has a comparative advantage. This does not change the impact of trade upon inequality. It nevertheless modifies one of the usual predictions of the HOS approach: the increase in the skill premium in the North no longer implies a decrease in the skill intensity in this area’s final good sector(s). This renders the model consistent with the observed variations in factor intensities.

Compared to Mankiw offshoring, offshoring in tasks as assumed by Grossmann & Rossi-Hansberg (2008) tends to magnify the impact of globalization on the skill premium and inequality. The reason for this is simple. When offshoring to the South concerns segments or intermediate goods, the whole production of the non-offshored segments (or intermediate goods) remains in the North, and this production normally utilises both skilled and unskilled tasks. In contrast, when tasks are offshored, all the unskilled tasks can be offshored to the South provided that the offshoring cost is smaller than the difference in unskilled wages between the North and the South. In this case, all ‘offshorable’ tasks are offshored and low skilled labour can only be employed in non-offshorable tasks which typically belong to non-tradable sectors. Consequently, the impact of offshoring in tasks on the employment of low skilled workers and the skill premium is larger than in the cases of trade in final and in intermediate goods.

To model very simply offshoring in tasks and reveal the different channels through which it impacts inequality, let us assume a World economy with (i) two products, one tradable manufacturing good  $M$  and one non-tradable service  $NT$ , (ii) two factors, high skilled labour  $H$  and low skilled labour  $L$ , and (iii) two countries, the North ( $N$ ) and the South ( $S$ ), the first being endowed with both factors and the second with low skilled labour only. The proportion  $\beta$  of income is allocated to the consumption of the tradable good and the proportion  $(1 - \beta)$  to the non-tradable service, and each worker supplies one unit of her/his type of labour (log-linear utility function). The non-tradable service is produced using unskilled labour only with the basic Leontief technology  $Y_{NT}^i = L_{NT}^i, i = N, S$  (the superscript indicates the country and

the subscript the sector). In the production of the tradable good  $M$ , there is a continuum of perfectly substitutable unskilled task with one unit of each task being produced by one unit of unskilled labour. This good is produced at the global level by Northern multinationals with the North Cobb-Douglas technology  $Y_M = A(L_M)^\alpha (H_M)^{1-\alpha}$ , where  $L_M$  is the set of unskilled tasks, and hence unskilled labour, utilised in the production of  $M$ . Offshoring an unskilled task to the South induces an offshoring cost which is modelled by an ‘iceberg’ process: when a task is offshored, a proportion  $\sigma$  of the related labour is lost for production. In addition, we assume that the productivity of low skilled labour is smaller in the South than in the North, one unit of  $L^S$  accounting for  $\lambda < 1$  unit of  $L^N$ . The markets for  $M$  and  $NT$  are both perfectly competitive. Globalization is characterised by (i) a decrease in the offshoring cost  $\sigma$ , (ii) a catching up of North productivity by the South (rise in  $\lambda$  which tends towards 1) and (iii) an increase in the number of South unskilled workers  $L^S$ , which depicts the growing number of developing countries and regions joining the globalised economy. Moreover, with the Cobb-Douglas technology in the manufacturing sector, skill biased technological change (SBTC) is depicted by a decrease in  $\alpha$ .

Assume first that all labour markets  $(L^N, H^N, L^S)$  are competitive, resulting in full employment. Then, two cases can be considered.

If at the equilibrium there are both northern and southern unskilled workers employed in the production of the tradable good  $M$ , then the North skill premium  $\hat{w}_N \equiv w_H^N / w_L^N$  and the North real unskilled wage  $\hat{\omega}_L^N \equiv w_L^N / p_N$  are (see Appendix):<sup>4</sup>

$$\hat{w}_N = \frac{(1-\alpha)\beta}{1-(1-\alpha)\beta} \frac{L^N + \lambda(1-\sigma)\beta L^S}{H^N} \quad (1)$$

$$\hat{\omega}_L^N = (A\alpha^\alpha (1-\alpha)^{1-\alpha})^\beta \hat{w}_N^{-\beta(1-\alpha)} \quad (2)$$

Eq. (1) shows that inequality in the North (the skill premium  $\hat{w}_N$ ) increases with the three components of globalization: the growing size of the South ( $\partial \hat{w}_N / \partial L^S > 0$ ), productivity catching-up ( $\partial \hat{w}_N / \partial \lambda > 0$ ) and the reduction in offshoring cost ( $\partial \hat{w}_N / \partial \sigma < 0$ ). Skill biased technological change (decrease in  $\alpha$ ) also fosters inequality ( $\partial \hat{w}_N / \partial \alpha < 0$ ) whereas skill

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<sup>4</sup>  $w_H^N$  and  $w_L^N$  are respectively the nominal wage of skilled and unskilled labour in the North and  $p_N$  the North consumer price.

upgrading in the North (increase in  $H_N$  and  $H_N / L_N$ ) logically lessens the skill premium and inequality. But globalization not only increases inequality. It also reduces the real unskilled wage  $\hat{w}_L^N$  which is a decreasing function of the skill premium (Eq. 2). Unskilled workers are thus twice injured, firstly in relative terms compared to the skilled, and secondly in absolute terms by the loss in purchasing power.

Globalization reduces the skill premium  $w_N$ , which sooner or later reaches the value  $\bar{w}_N = \frac{\beta}{1-\beta} \frac{L_N}{H_N}$  for which the unskilled tasks in manufacturing are no longer produced in the North. For  $\bar{w}_N$ , the price of the non-tradable services is sufficiently low to make the demand and production of this service employ the whole of the North unskilled labour.<sup>5</sup> From then on, all northern unskilled workers are employed in the non-tradable sector and the skill premium remains constant at  $\bar{w}_N$  provided that the North relative skill endowment  $H_N / L_N$  remains unchanged. Now, if the globalization dynamics is still active ( $\lambda(1-\sigma)L_S$  rises) when the North unskilled labour is fully employed in sector  $NT$ , this dynamics increases the real unskilled wage<sup>6</sup>, i.e., it becomes beneficial to unskilled workers.

Finally, the three components of globalization (rise in  $L_S$  and  $\lambda$ , and cut in  $\sigma$ ) always increase the real income *per capita* in the North (see Appendix A).

Suppose now that labour market imperfections and/or institutions prevent the unskilled wage adjustment in the North. Following Davis (1998a and b), this can be modelled by assuming a skill premium which is lower than its equilibrium value  $\hat{w}_N$  depicted by Eq. (1). Then, assuming that the markets for  $H^N$  and  $L^S$  are perfectly competitive, the adjustment operates by a decrease in  $L^N$ , i.e., unemployment (Eq. (1)), and this unemployment increases with globalization ( $\lambda(1-\sigma)L_S$ ).

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<sup>5</sup> When all the unskilled labour  $L_N$  is employed in sector  $NT$ ,  $Y_{NT}^N = L_N$  because of the production function,  $w_L^N = p_{NT}^N$  because of the zero-profit condition in a competitive market, and the demand function for  $NT$  is by assumption  $p_{NT}^N Y_{NT}^N = (1-\beta)(w_L^N L_N + w_H^N H_N)$ . Combining these relations yields  $\bar{w}_N = \frac{\beta}{1-\beta} \frac{L_N}{H_N}$  and  $\bar{w}_N$  is

attained when  $\lambda(1-\sigma)L_S$  reaches the value  $\frac{\beta^{-1} - (1-\alpha)}{(1-\alpha)(1-\beta)} L_N$ .

<sup>6</sup> The rise in  $\lambda(1-\sigma)L_S$  increases the skilled wage relative to the price of good  $M$ ,  $p_M$ , and, since the skill premium is constant in the North, the unskilled wage in the North relative to  $p_M$  increases as well.

The above reasoning shows that:

1. In a first stage, i.e., as long as there are northern unskilled workers employed in (offshorable) manufacturing tasks, globalization increases inequality (the skill premium) and the skilled workers' real wage and lessens the unskilled workers' real wage. Unskilled workers are consequently twice hurt, in relative (decreasing skill premium) and absolute (decreasing purchasing power) terms.

2. The non-tradable sector is the shelter for the northern unskilled workers whose tasks are offshored to the South.

3. The double penalty of northern unskilled workers comes to an end once all of them are employed in the non-tradable sector. This can correspond to a huge decrease in their purchasing power and a huge increase in inequality compared to the pre-globalization period, particularly when the unskilled account for a large share of the North labour force.

4. Once northern unskilled workers are fully employed in the non-tradable sector, the globalization dynamics equally increases the real wage of both skilled and unskilled workers and the skill premium remains unchanged.

5. Globalization generates an increase in the real income per capita in the North when all labour markets are competitive.

6. If market imperfections and/or institutions impede the unskilled wage adjustment in the North, globalization generates growing unskilled unemployment.

Those results show that if offshoring is on average beneficial to the North when nothing prevents wage adjustment (Result 5) it nevertheless generates winners (skilled workers) and losers (less skilled workers).

Since the late nineties, the impact of offshoring on inequality has generated an abundant empirical literature. The general diagnosis is that of a significant impact of offshoring on wages, earnings inequality and labour demand. We do not present a review of this literature and we refer to the surveys of Crino (2009) and Hummels et al. (2018) for extensive presentations.

Reviewing a large range of empirical works from 1999 up to 2008, Crino (2009) finds that material offshoring (offshoring in the production of goods, essentially manufacturing) had a negative impact on unskilled labour demand and unskilled workers' wage, whereas the impact was more mixed in the case of service offshoring. For western European countries, Crino (2007) nevertheless finds a positive impact of service offshoring on the demand for high skilled and a negative impact on the demand for low and medium skilled workers. In the

reviewed studies, the diagnoses logically depend on how offshoring is measured. It is important to note that the negative impact on unskilled workers is larger and significant when the indicator is centred on offshoring to emerging countries rather than on total offshoring, which is in line with the findings of the theoretical literature.

As regards the impact of offshoring on labour demand and wages, Hummels et al. (2018) distinguish three waves of studies, with the first centred on industry-level data, the second on firm-level data, and the third using worker-level data or matched worker-firm data. The first two waves clearly reveal a significant impact on both wages and employment at the detriment of less skilled workers and the third confirms the significant impact on individuals' wages.

### 3.3. Trade and technology interplay

Within the Supply-Demand-Institution framework,<sup>7</sup> technology is with globalization and institutional changes one of the major three explanations given to the rise in inequality in advanced economies. The economic literature has highlighted several mechanisms through which globalization and technology interact to influence wages and inequality.

#### 3.3.1. Capital-skill complementarity

When capital  $K$  and skilled labour  $H$  are complementary in the production function ('strict'  $K$ - $H$  complementarity), or more generally when capital and skill are more substitutable than capital and unskilled labour ('weak'  $K$ - $H$  complementarity), any change which fosters capital utilisation in production entails an increase in the demand for skilled relative to unskilled labour, and thereby in the skill premium and inequality.

A simple way to model the impact of capital-skill complementarity on inequality consists in considering the nested C.E.S. production function utilising capital  $K$ , skilled labour  $H$  and unskilled labour  $L$ :

$$Y = \left( aL^\rho + (1-a)F^\rho \right)^{1/\rho}, \quad F = \left( bH^\theta + (1-b)K^\theta \right)^{1/\theta} \quad (3)$$

The elasticities of substitution are  $\sigma_{KH} = (1-\theta)^{-1}$  between  $K$  and  $H$  and  $\sigma_{LF} = (1-\rho)^{-1}$  between  $L$  and the composite factor  $F$ , and we assume (i) that  $L$  and  $F$  are substitutable ( $\sigma_{LF} > 1 \Rightarrow 0 < \rho < 1$ ) and (ii) that  $K$  and  $H$  are either complementary ( $\sigma_{KH} < 1 \Rightarrow \theta < 0$ ) or less substitutable than  $L$  and  $F$  ( $\sigma_{LF} > \sigma_{KH} \Rightarrow \rho > \theta$ ).

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<sup>7</sup> The Supply-Demand-Institution framework determines inequality between skilled and unskilled workers from the interplay between supply of labour, demands for labour and institutions acting on market adjustment. See the presentation in Hellier (2013b).



We finally assume (i) that the time unit is the lifetime of capital and (ii) that physical capital is bought from financial capital. Then, the total capital return is  $R = (1+r)p_K$ , with  $p_K$  the unit price of physical capital and  $r$  the return to financial capital.

At the firms' optimum, the skill premium  $w \equiv w_H / w_L$ , indicator of earnings inequality, and the relative demand  $K/H$  are:

$$w = \frac{1-a}{a} b^{\rho/\theta} \left( 1 + \frac{1-b}{b} \left( \frac{K}{H} \right)^\theta \right)^{(\rho-\theta)/\theta} \left( \frac{L}{H} \right)^{1-\rho} \quad (4)$$

$$\frac{K}{H} = \left( \frac{1-b}{b} \right)^{1/(1-\theta)} \left( \frac{w_H}{(1+r)p_K} \right)^{1/(1-\theta)} \quad (5)$$

If globalization reduces the price of physical capital  $p_K$  through the relocation to the South of some production stages and tasks, then the demand for and utilisation of capital in relation to skilled labour ( $K/H$ ) rises (eq. 5). Eq. 4 shows that this entails an increase in the skill premium (i) when  $K$  and  $H$  are complementary and  $L$  and  $F$  substitutable<sup>8</sup> or (ii) when substitutability is higher between  $L$  and  $F$  than between  $H$  and  $K$ .<sup>9</sup> Those results stem from capital-skill complementarity. The cut in its price makes capital to substitute more for unskilled than for skilled labour, lessening the relative demand  $L/H$  and increasing thereby the skill premium. The relocation to China and South-East Asia of large fragments in the production of capital goods, especially computers and ITC materials, has substantially reduced their cost and boosted the skill premium because of  $K$ - $H$  complementarity.

Equation (4) also reveals the usual determinants of increasing inequality between skilled and unskilled wages: (i) the increase in low skill labour endowment at the World level due to North-South openness ( $\partial w / \partial(L/H) > 0$ ) and (ii) technological change which is detrimental to unskilled labour ( $\partial w / \partial a < 0$ )

It can be noted that, if the capital intensity  $K/H$  does not increase at the level induced ceteris paribus by the decrease in  $p_K$ , the adjustment can come from an increase in the return to financial capital  $r$ . Then, globalization induces a decrease in the unskilled wage in relation to both the skilled wage and the return to financial capital  $r$ .

<sup>8</sup> In eq. (4),  $\theta < 0$  and  $\rho > 0 \Rightarrow (\rho - \theta) / \theta < 0$ , hence  $\partial w / \partial(K/H) > 0$

<sup>9</sup>  $0 < \theta < \rho < 1 \Rightarrow \partial w / \partial(K/H) > 0$

### 3.3.2. *The backward effect of technological transfers*

When producing in the South, northern multinationals utilise northern technologies. Nevertheless, at the start of technological transfers, northern technologies are typically less efficient when used in the South because of poor infrastructures, less productive manpower, organisational deficiencies etc. With time, those shortcomings tend to disappear, which increases total factor productivity and labour productivity in the South.

Within a North-South HOS model or an intermediate goods-augmented North-South HOS model, total factor productivity catching-up acts exactly as an increase in the size (population) of the South: it increases inequality in the North (Hellier, 2013 and 2019). Hence, the catching up of northern productivity by the South increases the skill premium and inequality.

### **3.4. Polarization**

From the early eighties up to the mid-nineties, growing inequality was characterised in advanced economies by an increase in income which was all the greater as skill was high. Low skills experienced a decrease or stagnation in their real wages, medium skills a moderate growth and high skills a significant growth. From then on, the shape of inequality has changed and has displayed a 'polarised' profile. The pay of the lowest skills has slightly increased and the pay of the highest skills has continued to grow rapidly, whereas the middle skills have suffered a decrease or stagnation in their income. The routine jobs and tasks which required routine skills have been the major victims of this new dynamics.

As for inequality between unskilled and skilled workers, the usual suspects for polarization are technological change and globalization.

The technological explanation is based on task-biased technological change (TBTC): automation makes robots to replace routine tasks which are essentially medium skilled.

The first mechanism through which globalization is detrimental to medium skilled workers is similar to that presented for skilled-unskilled inequality. If skill upgrading increases medium skilled labour in the South, the world endowment of medium skill increases and medium skill wages decreases. In addition, if offshoring lowers the price of capital (automates), the high substitutability between capital and medium skills has the same polarization effect as TBTC (Acemoglu & Autor, 2011; Goos et al., 2014). In an inter-generational perspective, the initial skilled-unskilled inequality can subsequently foster polarization by encouraging children from low skilled family to acquire medium skills, which in turn lowers the medium skill wage and pushes the unskilled wage up. The pro-polarization

effect of offshoring is confirmed by several empirical works (Oldenski, 2014; Keller & Utar, 2016; Lewandowski et al, 2019).

To summarise, the impact of trade on inequality is essentially driven by North-South trade and it is multidimensional. First, as the South benefits from a comparative advantage in less (and now medium) skilled labour, the relocation to the South of low skill intensive final goods, segments and tasks increases the skill premium and inequality. In addition, the growing size of the South, its catching-up in productivity and the decrease in offshoring costs generate a lasting increase in inequality which only ends when the whole unskilled labour force is employed in non-tradable sectors and non-offshorable tasks. Finally, when the relocation of activities based on comparative advantages improves the real income per head but generates winners and losers, income transfers from the former to the latter could permit to improve everyone's welfare.

#### **4. Mobility of tax bases and global market for talents**

The decrease in mobility costs linked to the reduction in transportation costs and to technological and institutional changes is a key component of the present wave of globalization. The cut in mobility costs is not only beneficial to trade and FDI. It also encourages the mobility of tax bases, generating thereby between-country competition to attract those bases. The mobility of the elites finally tends to generate a globalized elite and to concentrate the return for talent in a limited number of hands at the World level, raising earnings at the top of the income ladder.

##### **4.1. Mobility of tax bases, Tax competition and Race to the bottom**

###### *4.1.1. Mobility of tax bases*

Consider the tax base  $b$  (capital, wealth, income, inheritance, etc.) which belongs to a resident in the Home country and which can be transferred to the Foreign country (\* depicts a Foreign value) with a mobility cost  $C(b)$ . This cost is a cost paid every year and not a one-shot (sunk) cost paid at the moment when the bases migrate from one country to the other. It is assumed that the mobility cost per unit of tax base  $c(b) = C(b)/b$  is marginally decreasing and tends

towards 0 when  $b$  tends towards infinite. This realistic assumption allows a mobility cost  $C(b)$  increasing with the base value  $b$  but at a lower rate, or decreasing with  $b$ .<sup>10</sup>

The tax rate on  $b$  is  $\tau$  in the home country and  $\tau^*$  in the foreign country. Then,  $b$  moves to the foreign country if and only if  $(1-\tau^*)b - C(b) > (1-\tau)b \Rightarrow \tau - \tau^* > c(b)$ .

Given the properties of  $c(b)$ , there is a unique  $\hat{b}$  such that  $c(\hat{b}) = \tau - \tau^*$  and all the tax bases smaller than  $\hat{b}$  remain in the Home country whereas all those above  $\hat{b}$  move to the foreign country. This reveals two key features:

1) The high tax bases ( $b > \hat{b}$ ) leave the country whereas the low tax bases ( $b < \hat{b}$ ) stay at Home.

2) For a given difference  $\tau - \tau^* > 0$ , globalization increases the number of tax bases which leave the Home country in two manners: (i) by lowering the mobility cost  $C(b)$ , and (ii) by increasing inequality in the distribution of tax bases, which makes the amount of bases above  $\hat{b}$  to increase.

#### 4.1.2. Tax competition and race to the bottom

Endogenising the tax rates permits to show how a race to the bottom arises when tax bases are mobile. The Home and Foreign countries have the respective populations  $N$  and  $N^*$ . In each country, tax bases are distributed in the population over the intervals  $[\underline{b}, \bar{b}]$  and  $[\underline{b}^*, \bar{b}^*]$  with the distribution functions  $f(b)$  and  $f^*(b)$ . We respectively denote  $B = N \int_{\underline{b}}^{\bar{b}} b \times f(b) db$  and  $B^* = N^* \int_{\underline{b}^*}^{\bar{b}^*} b \times f^*(b) db$  the total amount of tax bases in the Home and in the Foreign country. Both governments have the objective to provide a given amount of public services,  $G$  and  $G^*$  respectively, and this amount increases with the number of country residents. We finally assume that, in each country, the tax rates is uniform. Let  $\bar{\tau}$  and  $\bar{\tau}^*$  be the uniform tax rates which ensures the financing of the governments' objectives  $G$  and  $G^*$  when tax bases are not mobile, and assume to simplify that those rates are identical when bases are not mobile<sup>11</sup>:  $\bar{\tau} = \bar{\tau}^*$ . Finally assume that the countries shift from immobile tax bases to mobile tax bases with the unit mobility cost  $c(b) = C(b)/b$  being a decreasing function of  $b$ . Consequently, a difference  $\tau^* - \tau > 0$  between the Home and the Foreign tax rates makes all

<sup>10</sup> A simple way to model this cost is  $C(b) = c \times b^\beta + \bar{c}$ , with  $c > 0$ ,  $\bar{c} \geq 0$ ,  $\beta \leq 1$ ,  $(\bar{c}, \beta) \neq (0, 1)$ .

<sup>11</sup> This permits to have no base transfers when bases become mobile with the initial tax rates.

the Foreign bases  $b > \hat{b}$  move to the Home country, with  $c(\hat{b}) = \tau^* - \tau \Rightarrow \hat{b} = c^{-1}(\tau^* - \tau)$ . For tax bases migration to exist, it is necessary that  $\hat{b} < \bar{b}$ , i.e., the Home rate  $\tau$  must be lower than  $\tau^* - c(\bar{b})$ .

Consider the Home country at the time when tax bases become mobile. If this country lessens its tax rate from  $\bar{\tau}$  to  $\tau < \bar{\tau} - c(\bar{b})$ , its levies move from  $\bar{\tau} \times B$  to  $\tau(B + IB)$ ,  $IB$  being the inflow of bases from the Foreign country. This inflow is the sum of the Foreign bases which move to the Home country,  $IB(\tau) = N^* \int_{\hat{b}}^{\bar{b}} bf(b)db$  with  $\hat{b} = c^{-1}(\tau^* - \tau)$ .

Let us consider two cases as regards the tax base mobility. In the first, tax bases are mobile but their owners can remain in the Foreign country, the resident population of the Home country being then unchanged. This corresponds to source based taxation in which tax is collected where the base is produce. In the second case, the base owner must leave the country to pay her/his tax abroad. This refers to resident-based taxation in which tax is collected where the base owner lives. We assume that each government makes its decision by taking the other country's tax rate as given (Nash game).

When the resident population is constant (first case), the Home objective in public services is unchanged. The cut in the tax rate from  $\bar{\tau}$  to  $\tau < \bar{\tau}$  makes the Home levies move from  $\bar{T} = \bar{\tau} \times B$  to  $T(\tau) = \tau(B + IB(\tau))$ . There are two opposite impacts on levies, a negative impact  $((\tau - \bar{\tau})B < 0)$  linked to the decrease in  $\tau$  and a positive impact  $(\tau \times IB)$  linked to the inflow of tax bases ( $IB$ ). The condition for the positive impact to prevail is  $IB(\tau) > \frac{\bar{\tau} - \tau}{\tau} B$ :

the size (tax bases) of the Foreign country must be large compared to that of the Home country and/or the concentration of tax bases at the top (inequality) must be high in the Foreign country, which are the two elements which increase  $IB$ . In particular, the Foreign country must be large and the Home country small. Suppose it is the case, i.e., there are some

$\tau < \bar{\tau}$  such that  $IB(\tau) > \frac{\bar{\tau} - \tau}{\tau} B$ . Then, the Home government selects the smallest  $\tau < \bar{\tau}$ ,  $\tau_0$ ,

which allows achieving the goal  $G$ , i.e., such that  $T(\tau_0) = \bar{T}$ .<sup>12</sup> This entails a Foreign outflow of tax bases  $IB(\tau_0)$ . Facing this threat, the Foreign country is incited to lessen its tax rate at a level just below  $\tau_0 + c(\tau_0)$  which prevents the outflow of tax bases, provided that

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<sup>12</sup> There can be several  $\tau$  such that  $T(\tau) = \bar{T}$ , depending on the shape of the distribution function  $f(b)$ . If  $b \times f(b)$  increases with  $b$ , then this value is unique.

$(\tau_0 + c(\tau_0))B^* > \bar{\tau}^*(B^* - IB(\tau_0))$ . If  $(\tau_0 + c(\tau_0))B^* < \bar{\tau}^*(B^* - IB(\tau_0))$ , the Foreign government has no incentive to react to the cut in the Home tax rate and the couple of tax rates  $(\tau, \tau^*) = (\tau_0, \bar{\tau}^*)$  is an (Nash) equilibrium of the tax game between the two governments. This equilibrium leads to an increase in welfare for the Home country (the goal  $G$  can be achieved with a lower tax rate) and a decrease in the Foreign country (the goal  $G^*$  is no longer achievable). If  $(\tau_0 + c(\tau_0))B^* > \bar{\tau}^*(B^* - IB(\tau_0))$ , then the Foreign government sets its tax rate at  $(\tau_0 - c(\tau_0))$  to prevent the outflow of bases, which incite the Home government to lessen its tax rate just below  $\tau_0$  to ensure the inflow, and so on ... This typically generates a *race to the bottom*.<sup>13</sup> It can be noted that, (i) a large cut in the tax rates occurs at the beginning of the process, followed by small decreases afterwards, (ii) throughout the race to the bottom dynamics as well as at the equilibrium, the small Home country always has a tax rate smaller than that of the large Foreign country, (iii) when the race to the bottom occurs, both countries lose in welfare (both of them no longer reach their goal), and (iv) if globalization comes with a continuous decrease in the migration cost  $C(\tau)$ , then the race to the bottom is reinforced and the tax rate gap between the two countries tends to shrink.

When the location of tax bases cannot be separated from their owners, the migration of bases infers the migration of owners and an inflow of bases means an increase in the number of residents. As the governments' provision of public services increases with the number of residents, an inflow of tax bases tends to increase this provision. In this case, the preceding reasoning is still valid except that the inflow of bases must now compensate both the decrease in the tax rate and the increase in the provision of public services. Then, the concentration of the Foreign bases in a limited number of hands, i.e. an unequal distribution of bases, becomes a key factor to make the decrease in the tax rate beneficial because it makes the amount of bases increase far more than the related number of residents. The size (number of bases) of the country is still important, but only if bases are unevenly distributed.

Finally note that the above arguments suppose, either that the race to the bottom takes place without tax bases migration (all changes in tax rates occur before mobility), or that the repatriation of bases is costless. When there are bases outflows the repatriation of which is costly, this cost as well as the probability of future changes in the countries tax policies should be considered by the base owner when taking her/his decision.

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<sup>13</sup> The race to the bottom compulsorily comes to an end once the Home rate reaches the value  $\underline{\tau}$  such that  $\underline{\tau} = c(\underline{\tau})$ .

Tax competition essentially concerns corporate and high income taxation for which tax bases are mobile. Corporate tax on firms refers to the first case analysed here (capital and production leave the country but not the firm's owner) whereas income taxation typically refers to the second case (the income owner must move abroad).<sup>14</sup>

#### 4.1.3. *Corporate tax*

The analysis of tax competition was first developed by considering capital and firms mobility across American states, i.e. corporate taxation, because capital was more mobile than labour or persons.

Capital mobility spurs multinational corporations (MNCs) to locate their capital, production, headquarters and profits in the countries where the corporate tax is low. Consequently, governments are incited to lower the tax to attract capital from abroad, generating corporate tax competition (CTC) and the above-described race to the bottom.

Following the seminal work of Zodrow & Mierzkowski (1986), the theoretical and empirical analyses of CTC has known a large development over the last 35 years. This abundant literature has been reviewed in a number of survey articles, among others, Gresik (2001), Bretschger & Hettich (2002), Zodrow (2010), Genschel & Schwarz (2011), Devereux & Loretz (2012), Leibrecht & Hochgatterer (2012), etc.

A first strand of theoretical literature has shown that CTC reduces corporate taxation and thereby the provision of public goods and services. From a simple framework with an infinite number of identical countries, Zodrow & Mierzkowski (1986) showed that capital mobility-related tax competition leads to sub-optimal situations characterised by low capital taxation and under-provision of public goods. The initial model has subsequently been extended with the same result in terms of sub-optimality (Wildasin, 1988; Bucovetsky & Wilson, 1991; Wilson, 1999; Kanbur & Keen, 1993). One limit of those models is that they assume source based capital taxes (tax perceived where the firms produce). Assuming residence based taxation (taxing capital where their owners live) erases tax competition and re-establishes optimality (Bucovetsky & Wilson, 1991; Razin & Sadka, 1991). However, residence based taxation is difficult to enforce because of the lack of information-sharing between countries (Frenkel et al., 1991). In addition, rich capital owners can also decide to move from high tax to low tax countries.

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<sup>14</sup> Inheritance taxation can be treated as income taxation because it is linked to the mobility of persons.

On top of the international displacement of physical capital and production, MNCs implement profit-reallocation strategies to escape from corporate taxation. Several tax avoidance strategies have been analysed: intra-firm price setting between affiliates, strategic location of intellectual property, changes in the composition of the pay for executives (increasing the wage share of executive compensations), financing of affiliates by loans granted by other affiliates etc. We refer to the surveys by Dharmapala (2014), Hines (2014), Beer et al. (2020) and Wang et al. (2020) for a presentation of the different corporate tax avoidance strategies.

CTC and tax avoidance can be tested in several ways. First, one can estimate the social planner's reaction function and the race to the bottom by attesting that there is a positive relationship between the tax rate in one country and the tax rates abroad. Second, one can verify the impact of corporate taxation upon FDI inflows and outflows. Third, one can confirm that capital mobility or globalization reduces the corporate tax burden. Finally, one can assess the impact of differences in corporate tax rates on cross-country profit reallocation.

The results of the empirical literature tend to confirm corporate tax competition and corporate tax avoidance, even if certain results are more mixed. The CTC hypothesis and tax avoidance are clearly validated when focusing (i) on strategic interactions among governments (Zodrow, 2010, for a review), (ii) on the impact of globalization on statutory corporate tax rates (Benassy-Quéré et al., 2007; Cassette & Paty, 2008; Devereux et al., 2008; Devereux & Fuest, 2012), (iii) on the impact of taxation on FDI (reviews by DeMooij & Ederveen, 2006, and Devereux & Maffini, 2007)<sup>15</sup> and (iv) on the impact of tax rate divergence on between-country profit reallocation by MNCs (reviews by Beers et al., 2020). In contrast, CTC is rejected when considering the impact of capital mobility on the corporate taxation to GDP ratio, or on the effective tax rate (ratio of corporate taxes to profits in a country).<sup>16</sup> Several explanations have been given to the fact that globalization can increase the amount of corporate levies (agglomeration effect<sup>17</sup>; compensation effect; pro-tax vote due to growing inequality<sup>18</sup>; pro-firms public expenditures<sup>19</sup>). The decrease in levies due to lower statutory rates can also be offset by an increase in the tax bases (Hines, 2005) or by higher returns to capital when globalization raises the capital share of total income. Finally, the very

<sup>15</sup> See also DeMooij and Ederveen, (2008). In addition, Feld & Heckemeyer (2011) show that the tax-sensitivity of FDI has increased over time. Barrios et al. (2012) show the impact on both the parent and the host country.

<sup>16</sup> E.g., Slemrod, (2004), Hines, (2005), Mendoza & Tesar (2005), Dreher (2006a), Devereux et al. (2008), Devereux & Fuest (2012).

<sup>17</sup> The decrease in transportation costs increases the benefit of agglomeration of production units, which offsets tax differences (e.g., Baldwin and Krugman, 2000, Kind et al., 2000, Ludema and Wooton, 2000).

<sup>18</sup> Persson and Tabellini (1992).

<sup>19</sup> Benassy-Quéré et al. (2007).



mechanism of CTC can increase the amount of corporate taxes in small countries by attracting profits from abroad and increase the ratio  $\frac{\text{corporate taxation}}{\text{corporate profits}}$  in large countries by reducing the profits remaining in the country.

#### 4.1.4. *Income tax and social transfers*

Income tax competition (ITC) results from the possible migration of taxpayers to countries with low income taxation. The theoretical, and to a lesser extent empirical, analysis of income tax competition has known a significant development in the last three decades. This literature reveals several and sometimes opposite results, depending on the considered model and on its assumptions.

Following Mirrlees (1982) who analysed the impact of labour mobility on optimal income taxation, the ITC literature has focused on the behaviour of jurisdictions and countries which compete in income taxation and redistribution because of potential migration of both the (net) taxpayers and the (net) transfer recipients. With perfect mobility, Wildasin (1991) showed that the benefits for both types of individuals must be equalized across jurisdictions and that this can be achieved either by coordination or by a central government. Assuming no coordination and no central adjustment, Hindricks (1999) determines the Nash equilibria when the poor and the rich are imperfectly mobile and when jurisdictions can compete in tax, in transfers or in both. He finds (i) that the cut in redistribution is larger when competing in transfers than when competing in taxes, and (ii) that the mobility of the rich is harmful for redistribution, whereas the effect of the mobility of the poor depends on whether we are in a tax competition or a redistribution competition regime.

Simula & Trannoy (2010, 2012) analyse the consequence of ITC on taxation and welfare in models combining the impacts of taxes on both labour supply and taxpayers' migration with skill heterogeneity across individuals. They determine optimal taxation schedules depending on whether the welfare function is national-oriented (welfare of citizen living in the home country), citizen-oriented (citizen wherever they live) or resident-oriented (residents whatever their nationality), and on whether the individuals' skills are perfectly known or not. ITC reduces redistribution in almost all configurations. In a number of configurations, the marginal tax rate on the highest skill is reduced and it can even be decreasing. This can hurt the middle-skilled who pay more taxes to fund redistribution ('middle class curse').

Bierbrauer et al. (2013) analyse the choices of income tax systems in a model with tax competition between two countries, a welfare function depicting the average utility of

residents, non-observable skills and perfect mobility across countries. There is no equilibria in which individuals with the highest skill pay net taxes and no equilibria in which the lowest-skilled residents receive a subsidy, in either country. At the equilibrium, the highest skilled can even receive a net transfer funded by taxes on the lowest skilled.

Lehmann et al. (2014) determine the optimal marginal income tax rate corresponding to the Nash equilibrium between two countries maximizing a welfare objective (maximin) with individuals who differ in both skills and migration costs. The solution crucially depends on the semi-elasticity of migration. The simulation implemented for the US reveal a welfare loss between 0.4% and 5.3% for the worst-off and a gain between 19% and 29% for the top 1%.

In a world with a finite number of countries whose governments maximize the welfare of the low-skilled by taxing skilled workers' income, Tobias (2016) shows that a race to the bottom does not always emerges, the sustainability of the welfare state crucially depending on the shape of the probability distribution of skilled workers' location preferences.

The empirical works on income tax competition are more recent. If the decrease in the top marginal tax rates and their convergence are well documented (see Figs. 6 and 7), their relation with the threat of migration of tax bases is rather difficult to estimate. A number of works however suggest the existence of income tax competition. Several of them are centred on the Swiss case because of the key position of this country as a tax haven. By comparing the Swiss cantons, Feld & Reulier (2009) reveal a race to the bottom dynamics, with however no full convergence because of cultural divergence. Johannesen (2014) analyse the impact of the recent reform introducing a withholding tax which limits the scope for tax evasion on interest income for EU residents but not for non-EU residents. The after-reform large decline in deposits owned by EU residents relative to non-EU suggests that those deposits were motivated by tax evasion. For Denmark, Kleven et al. (2014) shows that the preferential foreigner tax scheme introduced in 1991 had a significant effect on the inflow of highly paid foreigners.

#### 4.1.5. *Key lessons on tax competition and inequality*

The above analyses on tax competition reveal several major lessons:

1) Because of tax bases mobility, governments are incited to reduce tax rates to attract foreign tax bases (offensive strategy), but also to prevent the outflow of domestic tax bases (defensive strategy).

2) Countries with a limited number of tax bases (small countries) typically adopt an offensive strategy because the positive impact of foreign bases inflows is large and the

negative effect of the loss in domestic levies is limited. The positive impact is all the larger as bases are unevenly distributed in foreign countries. Facing the threat of outflows of its domestic bases due to tax cuts in small countries, countries with large tax bases (large countries) respond by adopting a defensive strategy.

3) Those strategies generate a ‘race to the bottom’ of tax rates which is all the greater as globalization comes with a decrease in the migration cost of tax bases.

4) During the race to the bottom dynamics, countries experience a significant cut in tax rates at the beginning of the process followed by more limited decreases, and large countries always have a higher tax rate than small countries.

5) Globalization favours tax competition by increasing inequality and collecting the bases in a limited number of hands, and it reinforces the race to the bottom by reducing the migration costs of tax bases.

6) The decrease in the tax burden essentially affects capital owners and the top of the income spectrum, i.e., the winners of globalization in trade. Consequently, this directly (through cuts in taxes) and indirectly (by impeding the extension of redistribution necessary to offset the impact of North-South trade and offshoring) fosters inequality.

7) On top of tax competition, the mobility of low paid and poor workers also generates a between-country competition on social transfers which jeopardises redistribution.

Finally, on top of social transfer competition, firms’ mobility can foster inequality through two additional channels. First, firm can relocate their production to the countries with more flexible and less costly social rules. Second, the credible threat of relocation improves the employers’ position in the bargaining with employees by raising their outside option. This leads to a decrease in the employees’ bargaining power in terms of wage and employment.

#### **4.2. Globalization and the ‘superstars’**

In the last thirty years, the spectacular rise in income of high-level athletes, top artists and performers, top executives of multinationals etc. has questioned economic analysis. Even when considering that their skill and talent could have improved, this is not sufficient to explain such a vast increase in their payments. In the US the top 1% has caught most of the increase in the total real income from 1990 to 2010 (Haskel et al., 2012, Fig. 1, p.122).

Suppose that individuals differ in terms of talent. The key mechanism through which globalization fosters the return to talent is the enlargement of markets from the national to the world level. For this market size effect to operate, it must nevertheless be combined with

other hypotheses such as technological change, cultural standardisation and firm heterogeneity.

First consider athletes, artists and performers in general. Bourguignon (2012, pp.42-43) gives several enlightening examples of the substantial rise in the pay of the top performers. This results from the combination of technological change, which lowers the costs of spreading and broadcasting performances, and globalization, which considerably enlarges the market for performances. This is also fostered by the adoption of English as lingua franca and by the standardization of tastes at the World level. Suppose that the demand for performances moves from the national to the World (global) level. The higher competition between talents makes the sole most talented to survive and leads to an increase in the return for talent. In addition if there is a cost to meet foreign demand for domestic performers (depicting cultural differences and/or costly broadcasting techniques), then the set of performers is divided between the globalized ones who are in the global market and are better paid, and the purely national ones who only meet national demand. As globalization induces a decrease in the cost of performing abroad, this (i) increases the talent premium of the most talented, and (ii) eliminates an increasing number of purely national performers. Note that those mechanisms are similar to that presented by Melitz (2003) in the case of heterogeneous firms and exports.

The dramatic increase in the wages of top managers has given rise to a large literature. In an early contribution, Rosen (1981) showed that when managers differ in quality, the related difference in wages is magnified compared to the difference in quality. Following the upsurge in top managers incomes, several additional explanations have been proposed<sup>20</sup>: size of the firm (Gabaix & Landier, 2008), higher competition on wages (Subramanian, 2013), increasing importance of general managerial skills compared to firm-specific skills (Murphy & Zabojnik, 2007; Frydman, 2019). Globalization influences managerial pay (i) by enlarging the size of markets, (ii) by enlarging the size of firms, (iii) by generating a global market for managerial talents, and (iv) by increasing capital utilization when managerial skills and capital are complementary. The first three channels are determining in Gersbach & Schmutzler (2014) who show that globalization, defined as the concurrent integration of product markets and managerial pools, generates an increase in the heterogeneity of managerial salaries, leading to an increase in top executives' wages. The last channel is the main driver in Haskel et al. (2012) extended HOS approach with workers differing in talent.

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<sup>20</sup> See the reviews by, e.g., Edmans & Gabaix (2009) and Frydman, & Jenter (2010).

## 5. Anti-inequality policies and globalization

Institutional and policy changes (IPC) are, with globalization and technological change, the third major explanation given to rising inequalities in advanced economies. IPC may derive from the political orientation of the government or it can result from constraints which are imposed to public deciders. Globalization has been a major factor compelling governments to modify institutions and policies, as shown by the case of tax and social competition. It can also favour some political orientations and be detrimental to others.

By shortening the amount of levies available for redistribution, globalization firstly hampers social policies or/and supports the search for other public resources which are taken either from the less mobile middle class or from public debt. In addition, by lessening the earnings of less skilled workers, globalization generates and magnifies an inequality – unemployment tradeoff linked to social policies. Finally, since skill upgrading is the natural way to reduce unskilled labour, the impact of globalization on education is crucial to predict the dynamics of inequality in the long run.

### 5.1. Middle class curse, social democracy curse and growing public deficit.

The mobility of tax bases generates tax cuts which primarily benefit to capital owners and high incomes, i.e., the richest part of the population and winners of globalization. Concurrently, globalization hurts unskilled workers by reducing the demand for unskilled labour and by increasing the social risks linked to rapid sectoral changes.

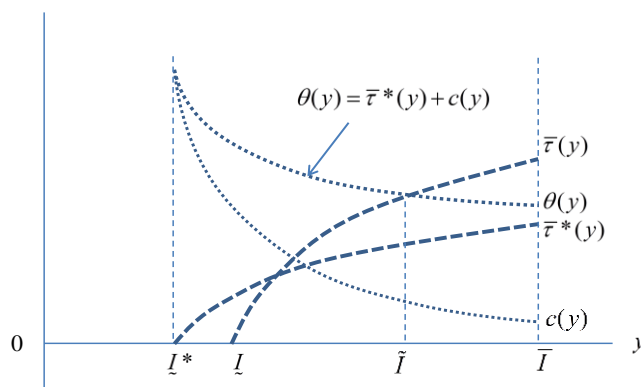
Two opposite effect on the public decider's behaviour can then be distinguished. Because of tax competition, s/he can firstly lessen taxes and public expenditures. This is what has been called the "efficiency effect". S/He can in contrast increase social expenditures so as to compensate the new risks linked to globalization (the so-called "compensation effect"). As already mentioned, the compensation effect typically necessitates new funding which can take two forms, taxation or public debt.

In the case of compensation, the social planner must displace the tax burden from the top incomes to the middle incomes.

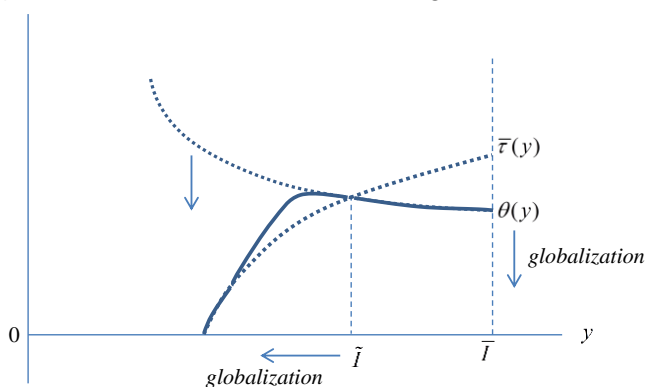
We present a very simple approach assuming two countries with different redistribution and tax progressivity goals to show how the equality-oriented country is constrained by the other country's policy. Assume two countries, Home and Foreign (foreign values depicted by a star\*) with the respective net-of-redistribution income tax rates  $\tau(y)$  and  $\tau^*(y)$ , which are functions of personal income  $y$ . There is a cost of migrating and living abroad which also

depends on the income  $y$ . As in Section 4.1, the unit cost of migrating (cost per unit of income)  $c(y)$  decreases with income. Then, a Home household with an income  $y$  such that  $\tau(y) > \tau^*(y) + c(y)$  migrates to the Foreign country. Finally, globalization comes with a continuous decline in the cost  $c(y)$ .

**Fig. 13.** Tax rates structures and no-migration constraint



**Fig. 14.** Tax rates structures and no-migration constraint



The governments maximise welfare functions which depend on redistribution and on the structure (progressivity) of the positive tax rates  $\{\tau(y)\}$  and  $\{\tau^*(y)\}$  which fully finance redistribution. The Home country has a social-democratic government: without migration, the Home optimal tax structure  $\{\bar{\tau}(y)\}$  is highly progressive with a large redistribution. The Foreign country has a conservative government with a weakly progressive optimal tax structure  $\{\bar{\tau}^*(y)\}$  and low redistribution in a no-migration situation. Fig. 13 depicts the two tax structures. We assume welfare functions and countries' sizes are such that: 1) governments do not modify their tax structure to attract bases from abroad, i.e., only

defensive strategies are considered, and 2) governments never let net taxpayers leave the country.<sup>21</sup> There is thus no tax-based migration at the equilibrium.

Let  $\bar{I}$  be the highest income which is assumed identical in both countries and denote  $\theta(y) \equiv \bar{\tau}^*(y) + c(y)$  the tax rate above which the Home household with income  $y$  migrates to the Foreign country. The rate  $\theta(y)$  moves down with globalization (Fig. 14). As long as  $\bar{\tau}(y) \leq \theta(y)$ , both countries remain at their most preferred redistribution and tax structures,  $\{\bar{\tau}(y)\}$  and  $\{\bar{\tau}^*(y)\}$ . As  $\theta(y)$  decreases,  $\bar{\tau}(\bar{I})$  becomes higher than  $\theta(\bar{I})$  sooner or later, and then the Home government must reduce all the tax rates  $\tau(y)$  such that  $\bar{\tau}(y) > \theta(y)$  at the value  $\theta(y)$  to avoid emigration. From then on, (i) a growing number of Home tax rates at the top are constrained by no-migration, (ii) the income  $\tilde{I}$  above which  $\tau(y) = \theta(y)$  decreases (Fig. 14), and (iii) the new optimal tax structure is no longer progressive.<sup>22</sup> Depicted by the bold curve in Fig. 14, this new tax structure combines (i) increasing regressivity at the top, (ii) higher tax rates for the incomes below the decreasing threshold  $\tilde{I}$ , which correspond to the middle class, and (iii) a decrease in redistribution expenditures.

The globalization-driven changes in the tax and redistribution structure lead to the following diagnosis:

1) The social democratic government is constrained in its taxation by the tax structure of the conservative government.

2) From a certain level, the decreasing cost of migrating and living abroad induces an increasingly regressive at the top tax structure, an increasingly increasing taxation of the middle class and a reduction in redistribution, in the social democratic country.

3) If the government wants to increase redistribution (e.g. to compensate the decrease in low skill wage due to globalization and technological change), the decreasing migration cost imposes a *redistribution-progressivity tradeoff* because more redistribution means higher transfers of taxes from the top to the middle incomes.

In summary, these developments generate both a middle class curse and a social democracy curse. The latter is all the greater as social democracy was typically based on an

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<sup>21</sup> This typically corresponds to a small social-democratic country facing a large conservative country because 1) to attract the large foreign bases the Home country should make its taxation highly regressive which does not improve its welfare, and 2) the large country can only attract a very limited amount of bases given the size of the Home country, which is not sufficient to offset the welfare loss due to the tax structure modification.

<sup>22</sup> When  $\partial\theta/\partial y = \partial\bar{\tau}^*/\partial y + \partial c/\partial y > 0$ , which is not the case in Fig.16, the new tax structure remains progressive but significantly less than the Home most preferred structure  $\{\bar{\tau}(y)\}$ .

implicit alliance between the lower and the middle class whereas the redistribution-progressivity tradeoff makes their interests to diverge.

The second way to fund the compensation effect is a public deficit paid by an increase in the public debt. The relation which binds globalization to the rise in public debt through the increase in uninsurable idiosyncratic risks and financial liberalization has been modelled by Azzimonti et al. (2014). As idiosyncratic risks are bound to rising inequality, this provides a framework for the analysis of the globalization-inequality-public debt nexus in which globalization acts through international financial liberalization. More broadly, globalization acts on public debt by three channels: 1) by increasing inequality, sectoral changes and social risks for the low and middle incomes, inducing a need for compensation; 2) by impeding the funding of compensation by taxes on high incomes because of tax competition; 3) by fostering public deficit and public borrowing through international financial liberalization.

Note that, by favouring the international funding of public debts, financial liberalization subsequently increases the international financial markets' pressure on governments' policies.

## **5.2. Labour market policies and the inequality-unemployment tradeoff**

Krugman (1994) was the first to clearly expose the mechanism of the inequality-unemployment tradeoff. Suppose an increase in the relative demand for skilled labour  $H^d / L^d$ . If the relative supply  $H^s / L^s$  is unchanged, a simple market clearing process leads to an increase in the skill premium  $w_H / w_L$ , i.e. in inequality. Suppose now that labour market institutions and policies prevent this market adjustment. Because of a minimum wage, of transfers, of unemployment compensations, of dismissal costs and rules etc. which raise the reservation wage and foster efficiency wage and/or insider-outsider mechanisms, the setting of the skill premium at its equilibrium level is hindered. This results in unemployment of the unskilled and generates an inequality-unemployment tradeoff (*IUT*): the higher the skill premium above its full employment level, the lower earnings inequality, and the higher unskilled unemployment.

As North-South trade and offshoring increase the relative demand for skill, the above mechanism shows that governments are confronted to an inequality-unemployment tradeoff in the setting of their social policies. The literature on this tradeoff has been surveyed by Dumont (2013), who shows that the empirical evidence of the IUT is rather mixed. This is not surprising because (i) a rise in the reservation wage generates voluntary unemployment which is not accounted in the data and (ii) the different labour market policies can have opposite



impacts on unemployment. Bicakova (2014) nevertheless finds that the tradeoff is confirmed in a number of countries. In addition, the experience of Germany which significantly modified its labour market institution in the late 1990s and early 2000s (Hartz reform) also reveals an IU tradeoff (Beissinger et al., 2016).

### **5.3. Globalization, education and inequality**

The impact of globalization on inequality derives to a large extent from the impact on wages of the decline in the demand for unskilled labour. A natural way to offset this effect is skill upgrading, i.e., an upsurge in the education level of the working population which lessen unskilled labour supply, compensating thereby the negative effect of the decrease in demand. This raises the question of the impact of globalization on education and human capital accumulation.

A number of works have analysed the impact of trade and openness on skill accumulation (Falvey et al., 2008, for a review). Two opposite effects can be distinguished which are based on the rise in the skill premium in the North resulting from trade with the South.

First, a higher skill premium incites individuals to increase their skill. This positive *incentive effect* was highlighted by Findlay & Kierzkowski (1983) who endogenized the accumulation of human capital within a North-South Heckscher-Ohlinian model with skilled and unskilled labour. In each area, openness increases the return to the abundant factor, which encourages education and human capital accumulation in the North and hampers them in the South. From a similar approach with different abilities among individuals, Borsook (1987) showed that openness promotes education and increases inequality in the North. Difference in abilities is also assumed by Dinopoulos & Segerstrom (1999) in a model where openness boosts the skill intensive R&D activity, which increases the skill premium and incites more individuals to get educated. North-South trade is skill-enhancing in Grossman & Helpman (1991) as well as in Janeba (2003) who show that higher import competition favours education in a small open economy. From a model with a large number of small countries, heterogeneous workers and between-country differences in skill augmenting technology, Auer (2015) shows that trade generates divergence in human capital accumulation and favours the countries which are well-endowed with high-skilled labour. The results provided by Falvey (2010) and Borissov & Hellier (2013) are more mixed. Falvey et al. (2010) analyse the impacts of a trade liberalisation on a small advanced economy within a HOS framework augmented by an educational sector which utilises skilled labour. Individuals with different

abilities can choose to get educated throughout their working lives. The authors insist on the transitional dynamics generated by the increases in the imports of the unskilled intensive good and they distinguish between anticipated and non-anticipated trade expansions. Trade expansion leads to both skill upgrading and higher inequality, but the intensity of these moves depends on the distribution of ability across individuals and on whether trade liberalisation is anticipated or not. Within an overlapping generation model with skill accumulation and North-South trade, Borissov & Hellier (2013) find that a large globalization shock boosts education and increases the proportion of skilled workers but not a small shock. The impact is different for the generation in work and for the following generations. Finally, there is a threshold value of the skill endowment under which the globalization shock lowers inequality, and above which it increases inequality.

The opposite effect in which openness hampers human capital accumulation results from the fact that, as the education activity essentially utilises skilled labour, the trade-driven increase in skilled wages raises the cost of education in the North, which discourages human capital accumulation. This negative *cost effect* was put forward by Cartiglia (1997) and Eicher (1999). When assuming credit market imperfections, the negative effect is logically magnified (Cartiglia, 1997).<sup>23</sup>

The above two opposite effects are based on the impact of North-South trade on the skill premium. Another negative effect on skill accumulation can derive from tax competition. If tax competition leads to a decrease in public expenditure on education, this hurts essentially the low income families when there are credit constraints and/or fixed costs of education.

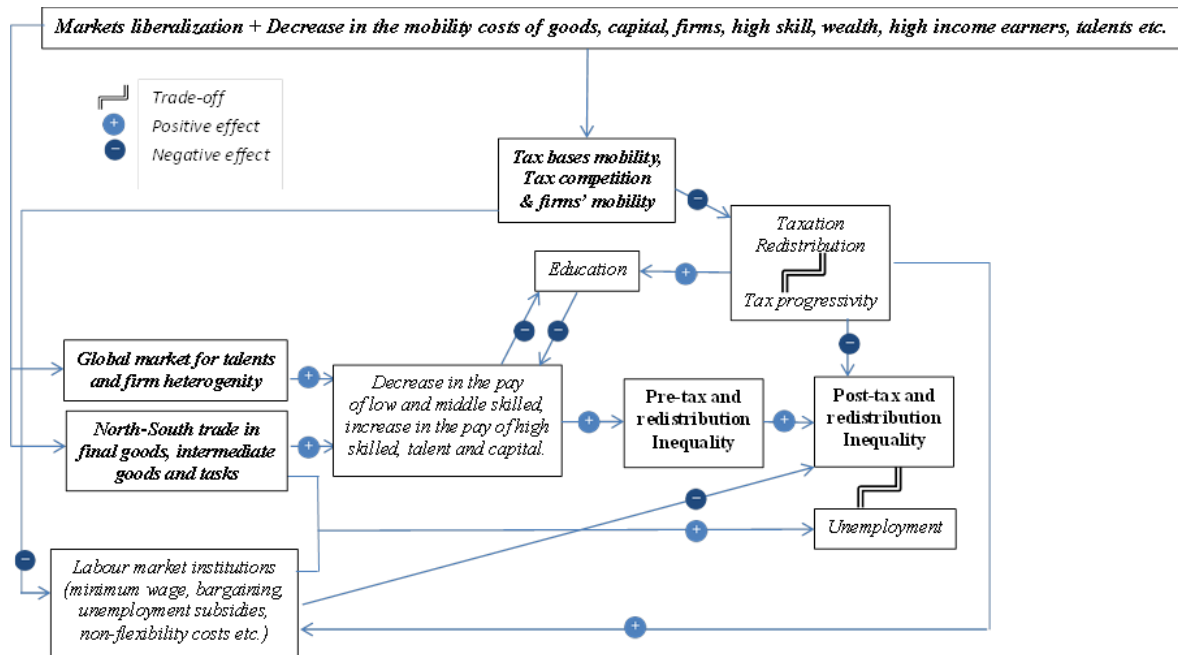
Finally, if the education of the elite becomes increasingly globalised, with the most elitist universities becoming increasingly costly and selective, this typically generates a self-reproducing globalised elite (Brezis & Hellier, 2018) which fosters inequality in the longer term.

## 6. Implications for further researches and conclusion

The different dimensions of globalization and the different channels through which they act and interact to impact inequality in advanced economies have been reviewed. Those channels are summarised in Fig. 15.

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<sup>23</sup> Nevertheless, Ranjan (2001) shows that trade liberalisation can boost human capital accumulation in both the North and the South when credit-market imperfections are sufficiently low in the former and high in the latter.

**Fig. 15.** The globalization-Inequality nexus

North-South trade of final goods, of intermediate goods and of tasks increases the wage divergence between unskilled and medium skilled workers on the one hand, and high skilled workers and capital owners on the other hand. The resulting rise in inequality is reinforced by the emergence of a global market for talents. Nevertheless, provided that the globalization-induced increase in inequality comes with a globalization-induced increase in the average income, redistribution from the winners to the losers could permit to improve everyone's welfare. This solution is however hampered by the mobility of tax bases which generates between-country tax competition and lessens the winners' tax burden. Finally, the combination of growing pre-tax and redistribution inequality and tax competition constrains social and redistributive policies. In the short term, governments have the choice between letting inequality grow and compensating the loss of the less skilled, either by taxing more the middle class or by generating budget deficits. When opting for compensation, this tends to generate a middle class curse and a growing public debt. Finally, globalization constrains public policies by generating both a redistribution-progressivity tradeoff and a inequality-unemployment tradeoff. This leads to a social democracy curse because (i) progressivity is a key component of redistribution and (ii) it makes the interests of the lower and the middle class to diverge. It can also hamper skill upgrading which is yet the natural way to oppose globalization-driven inequality in the longer term.

This diagnosis is supported by both the theoretical literature and the empirical evidence on trade and inequality, on offshoring, on corporate and income tax competition and on public

liabilities. It leads to several challenges in terms of research, policy tools and political developments.

As regards the trade-inequality relationship, several points have already been mentioned in the literature (see, e.g., Chusseau et al, 2008). First, trade should not be considered as a whole but it must be divided between North-North and North-South trade, because the former has an ambiguous or slightly negative impact on inequality whereas the latter can significantly increase inequality. Second, when analysing the effect of NST on an advanced country, one should not only consider its trade with emerging economies but also the South exports that have substituted to the country's exports, which can be difficult to measure. Third, one must distinguish trade in final goods from offshoring. Fourth, trade is not independent from technical change and institutional changes, which makes a measurement of the respective impacts of those three explanations difficult. Finally, the impact can notably differ across countries depending on their initial specialization in trade, factor endowments and policies.

A key consequence of our analysis is that the globalization – inequality nexus cannot be limited to the trade – inequality relationship. Estimating the combined impact of the different channels depicted in Fig. 14 could reveal to be difficult because of the multiplicity of interconnected mechanisms. In fact, the same initial mechanism can lead to very diverse outcomes in terms of inequality depending on the response of the governments, which is itself impacted by globalization. The effects of North-South trade on labour demands concern all advanced countries, albeit with different intensities depending on their skill endowments. Some countries have let market forces operate, resulting in growing inequality. In others, earnings inequality has been limited by rules and institutions (minimum wage, unionisation, unemployment compensation which improves the workers' outside option in the bargaining process etc.) but this has generated unemployment. Still others have favoured redistribution to compensate the impact of globalization. But the induced public expenditures must be financed, either by taxing the middle class, or by public liabilities, or even by limiting other expenditures such as spending on education and health, which can increase inequality in the longer term. When considering all those situations and their effects on after tax and redistribution inequality, globalization can generate high inequality, low or no inequality with unemployment, moderate inequality with high taxation of the middle class,<sup>24</sup> low or no inequality with growing public debt or a reduction in education expenditures.

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<sup>24</sup> Taxing more the middle class without taxing the top of the income spectrum increases inequality, but this increase is moderated by the transfer of the taxes to the lower class which would have otherwise suffered a

Finally, the above analysis shows that focusing on the globalization – inequality nexus can be itself misleading. Globalization has beneficial effects on advanced economies in terms of resource allocation and total income at full employment, but it also has unexpected effects such as inequality and polarization, unemployment, displacement of the tax burden from the upper to the middle class and increase in public debt. Those unexpected effects can substitute for each other depending on the governments' policy choices. They thereby form a whole and a coherent approach should consider those different dimensions because the potential impact on inequality can be hidden and replaced by the increase in unemployment, in public deficit, in middle class taxation or by decreasing public expenditures on education and health. In other words: the globalization-enhancing inequality can take the form of growing unemployment, middle class taxation and/or public debt, depending on the countries' policy context.

All those remarks reveal the difficulty of assessing the overall impact of globalization on inequality as well as the derived and substituting effects on other variables (unemployment, public debt, middle class welfare etc.). A first solution could consist in the concurrent estimation of several equations depicting the different mechanisms portrayed in Fig. 14. A first equation could bind the before tax and redistribution inequality index to several indicators of globalization (North-North and North-South trade of final goods, North-North and North-South offshoring, North-North and North-South FDI, variation in global cultural proximity measuring the globalization of talents), of technological changes and of the skill endowment. An estimate of the globalization-technological change interplays should be concurrently set. Second, the after tax and redistribution inequality could be bound to pre-tax and redistribution inequality and to a number of indicators of institutional rules and policy tools. Then, each rule and tool could be bound to the globalization-driven constraints which impact on their setting (mobility of tax bases, social competition etc.). In fact, most of those relationships have already been assessed in the economic literature (and mentioned in this paper), but the estimates have typically been implemented independently of each other for particular countries and periods. Implementing them together could provide a coherent picture of the complexity of the different mechanisms composing the globalization-inequality story. This research strategy is of course conditioned by the existence or building of appropriate indicators of the different variables for a sufficiently large number of countries and years. Finally note that the alternative strategy consisting in binding inequality to a synthetic globalization index is not really appropriate for measuring its influence. In particular, the KOF index of globalization, divided in three partial indices depicting its economic, social and

political dimensions (Dreher, 2006b), provide a nice and helpful synthetic indicator. The KOF index has been used in different works to study the impact of globalization on inequality, implicit tax rates and social expenditures, with mixed and often non-significant results.<sup>25</sup> Those ambiguous effects are not really surprising given that the index combines North-North and North-South trade and FDI which typically have divergent impacts on inequality.

A limit of setting concurrent estimates is that, if it permits to verify the relationships highlighted in Fig. 15, it cannot provide a precise measurement of the different and substitutable impacts of globalization. In particular, it cannot answer the followings questions: 1) what is the increase in unemployment induced by a one-point decrease in the pre-tax earnings inequality?; 2) What is the middle class over-taxation or the increase in public debt which permits to decrease by one point the after-tax and redistribution inequality for one country?; 3) What would be the cost to pay in terms of tax bases migration and total income for maintaining a taxation structure which reduces inequality and induces tax bases outflows? etc. Answering those questions requires a modelling of the relations depicted in Fig. 14, with adequate parameters and coefficients, and which can be utilised to simulate the impacts of the different dimensions of globalization on the targeted variables. Such models could be conceived for single countries, groups of countries or at a broader North-South level, and the parameters could derive from the above-mentioned set of estimates.

This twofold research programme can be seen as very ambitious and its setting is conditioned by the availability of data to implement the concurrent estimations and calculate the required parameters and coefficients. It nevertheless could permit to put together the different mechanisms which act on the globalization-inequality nexus.

Finally, the relations put forward in Fig. 15 have crucial political implications. The rise in populism and the present rejection of globalization by a rising proportion of voters in advanced countries is indubitably linked to the sentiment that growing inequality and poverty is the result of globalization. This has led to an increase in trade barriers and new protectionist policies. The diagnosis presented here shows that the different dimensions of North-South trade do have a pro-inequality effect. We have nevertheless noted that, when unemployment can be avoided, NST also increases the real income per capita in advanced economies. Consequently, averting the inequality effect of globalization should focus on combating tax and social competition which prevent to compensate the losers' damages rather than to erect customs barriers.

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<sup>25</sup> See the survey by Potrafke (2014).

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### Appendix.

As the share  $\beta$  of the North total income is allocated to the purchase of service  $NT$ , given the production functions in sectors  $NT$  ( $Y_N^{NT} = L_N^{NT}$ ) and  $M$  ( $Y_M = A(L_M^S + L_M^N)^\alpha H_N^{1-\alpha}$ ) and the equality *demand = supply* in the market for  $L^N$  ( $L_{NT}^N + L_M^N = L^N$ ), the North skill premium  $w_N = w_H^N / w_L^N$ , the prices of  $M$  and of  $NT$  in the North,  $p_M$  and  $p_{NT}^N$ , and the consumer price in the North  $p_N$  are:

$$\boxed{w_N = \frac{(1-\alpha)\beta}{1-(1-\alpha)\beta} \frac{L_N + \lambda(1-\sigma)L_S^M}{H_N}}, \quad \frac{\partial w_N}{\partial \lambda} > 0; \quad \frac{\partial w_N}{\partial L_S^M} > 0; \quad \frac{\partial w_N}{\partial \sigma} < 0; \quad \frac{\partial w_N}{\partial \alpha} < 0$$

$$p_M = A^{-1} \left( \frac{w_L^N}{\alpha} \right)^\alpha \left( \frac{w_H}{1-\alpha} \right)^{1-\alpha} = \frac{w_N^{1-\alpha}}{A\alpha^\alpha (1-\alpha)^{1-\alpha}} w_L^N = \frac{w_N^{-\alpha}}{A\alpha^\alpha (1-\alpha)^{1-\alpha}} w_H^N$$

$$p_{NT}^N = w_L^N$$

$$p_N = (p_M)^\beta (p_{NT}^N)^{1-\beta} \Rightarrow \boxed{p_N = (p_M)^\beta (w_L^N)^{1-\beta}}$$

Since  $w_L^N = \frac{A\alpha^\alpha (1-\alpha)^{1-\alpha}}{w_N^{1-\alpha}} p_M$  and  $w_H^N = A\alpha^\alpha (1-\alpha)^{1-\alpha} w_N^\alpha p_M$ , the real unskilled and skilled wages in the North,  $\omega_L^N = w_L^N / p_N$  and  $\omega_H^N = w_H^N / p_N$ , are:

$$\omega_L^N = \frac{w_L^N}{p_N} = \frac{A\alpha^\alpha (1-\alpha)^{1-\alpha} p_M}{w_N^{1-\alpha} (p_M)^\beta (w_L^N)^{1-\beta}} = \frac{A\alpha^\alpha (1-\alpha)^{1-\alpha} (p_M)^{1-\beta}}{w_N^{1-\alpha} (w_L^N)^{1-\beta}} = \frac{A\alpha^\alpha (1-\alpha)^{1-\alpha} (p_M)^{1-\beta}}{w_N^{1-\alpha} \left( \frac{A\alpha^\alpha (1-\alpha)^{1-\alpha}}{w_N^{1-\alpha}} p_M \right)^{1-\beta}}$$

$$\omega_L^N = \left( A\alpha^\alpha (1-\alpha)^{1-\alpha} \right)^\beta w_N^{-\beta(1-\alpha)} = \left( A\alpha^\alpha (\beta^{-1} - (1-\alpha))^{1-\alpha} \right)^\beta \left( \frac{H_N}{L_N + \lambda(1-\sigma)L_S^M} \right)^{\beta(1-\alpha)}$$

$$\boxed{\omega_L^N = \left( A\alpha^\alpha (\beta^{-1} - (1-\alpha))^{1-\alpha} \right)^\beta \left( \frac{H_N}{L_N + \lambda(1-\sigma)L_S^M} \right)^{\beta(1-\alpha)}}$$

Hence:  $\frac{\partial \omega_L^N}{\partial \lambda} < 0$ ;  $\frac{\partial \omega_L^N}{\partial L_S^M} < 0$ ;  $\frac{\partial \omega_L^N}{\partial \sigma} > 0$

$$\omega_H^N = \frac{w_H^N}{p_N} = \frac{A\alpha^\alpha (1-\alpha)^{1-\alpha} w_N^\alpha p_M}{(p_M)^\beta (w_L^N)^{1-\beta}} = \frac{A\alpha^\alpha (1-\alpha)^{1-\alpha} w_N^\alpha p_M^{1-\beta}}{\left( \frac{A\alpha^\alpha (1-\alpha)^{1-\alpha}}{w_N^{1-\alpha}} p_M \right)^{1-\beta}} = \left( A\alpha^\alpha (1-\alpha)^{1-\alpha} \right)^\beta w_N^{1-\beta(1-\alpha)}$$

$$\boxed{\omega_H^N = \frac{A^\beta \alpha^{\alpha\beta} (1-\alpha) \beta^{1-(1-\alpha)\beta}}{(1-(1-\alpha)\beta)^{1-(1-\alpha)\beta}} \left( \frac{L_N + \lambda(1-\sigma)L_S^M}{H_N} \right)^{1-(1-\alpha)\beta}}$$

Hence:  $\frac{\partial \omega_H^N}{\partial \lambda} > 0$ ;  $\frac{\partial \omega_H^N}{\partial L_S^M} > 0$ ;  $\frac{\partial \omega_H^N}{\partial \sigma} < 0$

Finally the real income per head in the North  $i_R = \frac{\omega_L^N L_N + \omega_H^N H_N}{L_N + H_N}$  is:

$$i_R = \left( A \alpha^\alpha (1-\alpha)^{1-\alpha} \right)^\beta \left( \frac{L_N}{L_N + H_N} w_N^{-\beta(1-\alpha)} + \frac{H_N}{L_N + H_N} w_N^{1-\beta(1-\alpha)} \right)$$

$$\frac{\partial i_R}{\partial w_N} = \frac{\left( A \alpha^\alpha (1-\alpha)^{1-\alpha} \right)^\beta}{L_N + H_N} \left( -\beta(1-\alpha) L_N w_N^{-1-\beta(1-\alpha)} + (1-\beta(1-\alpha)) H_N w_N^{-\beta(1-\alpha)} \right)$$

$$\frac{\partial i_R}{\partial w_N} > 0 \Leftrightarrow w_N > \frac{\beta(1-\alpha)}{1-\beta(1-\alpha)} \frac{L_N}{H_N}$$

$$w_N > \frac{\beta(1-\alpha)}{1-\beta(1-\alpha)} \frac{L_N}{H_N} \text{ when globalization is not nil since } w_N = \frac{\beta(1-\alpha)}{1-\beta(1-\alpha)} \frac{L_N}{H_N} \text{ when}$$

globalization is nil and  $w_N$  increases with globalization. Hence  $\frac{\partial i_R}{\partial w_N} > 0$  and finally:

$$\frac{\partial i_R}{\partial \lambda} > 0; \quad \frac{\partial i_R}{\partial L_S^M} > 0; \quad \frac{\partial i_R}{\partial \sigma} < 0$$