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## The Challenge of Market Power under Globalization



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## Abstract

The legacy of Adam Smith leads to a false confidence on the optimality of laissez faire policies for the global market economy. Instead, the polarized character of current globalization deeply affects both developed and underdeveloped economies. Current globalization is characterized by factor exchange between economies of persistently unequal development. This implies the existence of persistent extraordinary market power in transnational corporations, reflected in their disproportionate participation in income and policy. These are shown to be steady state features of globalization in a convergence club model of development and underdevelopment including trade and FDI. Moreover, results in tax competition explain how the increased share of transnational profits under globalization leads to lower corporate taxes, more conservative policies, and weaker institutions for balancing market power. The increased level of market power under globalization poses a serious challenge for national and global governance that deeply impacts economic development, distribution, sustainability and democracy everywhere.

## Resumen

El legado de Adam Smith conlleva a una falsa confianza sobre la optimalidad de las políticas de libre mercado aplicadas a la economía de mercado global. En lugar de ello, el carácter polarizado de la globalización actual afecta profundamente tanto a los países desarrollados como a los subdesarrollados. Dicha globalización se caracteriza por el intercambio de factores de producción entre economías con niveles de desarrollo persistentemente diferentes. Esto da lugar a que las corporaciones transnacionales detentan un poder de mercado extraordinario y persistente, reflejado en su participación desproporcionada tanto en el ingreso como en la política. Demostramos mediante un modelo teórico que estos hechos caracterizan el estado estacionario de la globalización. Dicho modelo de la globalización consiste de un modelo de desarrollo y subdesarrollo a través del cambio tecnológico endógeno que incluye el comercio y la inversión extranjera directa. Aplicando a este modelo resultados de la competencia internacional a la baja en impuestos, explicamos como el incremento en las ganancias transnacionales característico de la globalización conlleva a menores tasas impositivas para las corporaciones, a políticas más conservadoras, y a instituciones para balancear el poder de mercado más débiles. El mayor nivel de poder de mercado bajo la globalización plantea un serio reto a la gobernanza nacional y mundial que impacta profundamente el desarrollo económico, la distribución, la sustentabilidad y la democracia en todo el planeta.

Key words: globalization, transnational corporations, underdevelopment, concentration, inequality, economic growth.

JEL codes F02, F10, F23, F60, O10.

## 1. INTRODUCTION

The acceleration of globalization in the 1980's began with Ronald Reagan and Margaret Thatcher's liberalization policies. Faced with the stagflation crisis of the 1970's and the first oil crisis, they restarted economic growth by freeing trade and investment. In November 1982, a ministerial meeting of the General Agreement on Tariffs and Trade (GATT) proposed what became the Uruguay Round of negotiations, "the largest negotiation of any kind in history," launched in 1986, concluded in 1994, and signed by 123 countries, that led to the creation of the World Trade Organization (WTO) in 1995.<sup>1</sup> Amongst the issues addressed in the negotiations were investment, trade in services, and intellectual property. Meanwhile, the Washington Consensus (a term coined in 1989) implemented the standard New Classical reform in any developing country that faced a crisis, recommending and imposing liberalization of trade and foreign direct investment (FDI), privatization, and deregulation.

In addition to Western liberalization, China's introduction of market mechanisms in its economy in December 1978, and the fall of the Berlin Wall in 1989, created a global market economy.

**1.1. Main features of globalization.** Liberalization tapped a huge potential for economic growth. For twenty five years worldwide exports grew at a rate of 6.2%, approximately doubling as a proportion of world GDP from, 14.5% in 1982 to 30.6% in 2006.<sup>2</sup> While this classifies as miracle growth, FDI grew at an average real rate of 14.6% a year. Of this investment, a great part consisted of mergers and acquisitions, for example 89.3% in 2007. While aggregate world exports of goods and non-factor services reached U.S. \$17 trillion dollars in 2007, aggregate sales of foreign affiliates of TNCs reached U.S. \$31 trillion, surpassing 50% of world GDP in the years 2008-2010. Transnational corporations (TNCs) have come to play a central role in the global economy. At \$6 trillion, the gross product of foreign affiliates of TNCs reached 43.7% of US GDP, which is \$15 trillion. In 2010, TNCs accounted for one-quarter of world GDP. The 100 largest non-financial TNCs produced 14.1% of world GDP in 2007.

In fact market concentration has been the norm rather than the exception for US production during the 20th Century. From 1935 to 1992, the average production of the four largest firms in 459 industries was 38.4% of all shipments. Similarly, from 1992 to 2002, the 200 largest manufacturing companies accounted for 40% of manufacturing value added. Thus in the US the equilibrium level of concentration was higher than at the global level, where it therefore stands to increase further.<sup>3</sup>

In 2010, more than half of FDI went to developing economies. As we shall show in our model, what results from FDI between developed and underdeveloped economies is a polarized form of globalization that admits the coexistence of development and underdevelopment, and is characterized by huge steady-state profit flows with very significant impacts. In 2007, FDI profits amounted

<sup>1</sup>Information from [http://www.wto.org/english/thewto\\_e/whatis\\_e/tif\\_e/fact5\\_e.htm](http://www.wto.org/english/thewto_e/whatis_e/tif_e/fact5_e.htm), the World Trade Organization web page, accessed 11/15/2008.

<sup>2</sup>The following discussion is based on the 2009 and 2011 World Investment Reports (UNCTAD, 2009, 2011) unless stated otherwise. These are truly treasure troves of information on the world economy. Serious attempts have been made to silence UNCTAD as a source of information and analysis (Khor, 2012a, 2012b, Prashad, 2012).

<sup>3</sup>Data from U.S. Census Bureau – Economic Census. 1992. "Concentration Ratios for the U.S." <http://www.census.gov/epcd/www/concentration92-47.xls>. Consistently with market power, Hall (1988) shows in a study of US industry that marginal cost is often well below price.

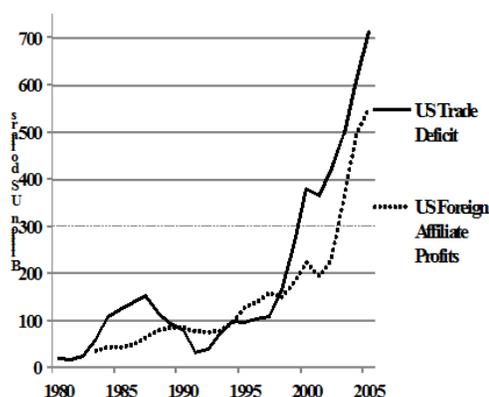


Figure 1. Comparison between US Trade Deficit and US Foreign Affiliate Profits, 1980-2005. Sources: Foreign trade statistics, census.gov and UNCTAD FDI/TNC database.

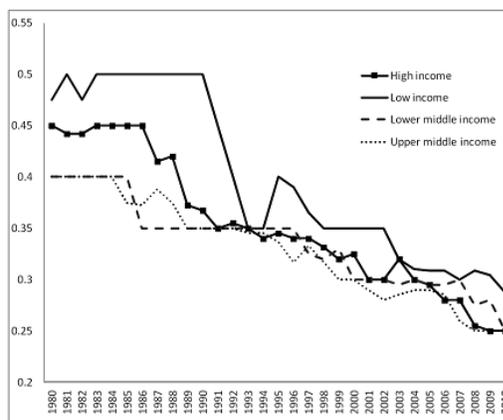


Figure 2. Median statutory corporate tax rates by World Bank country income group, 1980-2010. Source: Keen and Konrad (2012).

to \$1.1 trillion, a profit rate of about 7% of their gross income. About 30% was reinvested. Much of the remaining 70% must have remained offshore, as indicated by the following three pieces of information. First, the US \$700 billion trade deficit was of the same size as these profits, indicating a mass of capital invested in US brokerage instruments under foreign corporate names. This approximate relationship between the profits of US foreign affiliates and the US trade deficit has held for many years, see Figure 1. Second, the frequent lobbying for tax holidays by US corporations generating profits abroad (see Marr and Highsmith, 2011). Third, as reported by Tax Justice International (Henry, 2012), between \$21 and \$31 trillion dollars in assets were held offshore at the end of 2010, that is, between 1.4 and 2.1 times the US GDP!

The huge profits flows registered under globalization contributed to the global saving glut observed by Bernanke (2005). In turn they contributed to a long-term decrease in interest rates that continues to this day, and to the 2008 crisis.<sup>4</sup>

The policies that strengthened markets and weakened government in the 1980's also raised inequality in the U.S. Using IRS tax data, Piketty and Saez<sup>5</sup> have shown that, while the bottom 90% has seen their income share drop from 66.8% in 1982 to 54.7% in 2006, the top 10%, 1%, 0.1% and 0.01% income brackets saw their income shares multiplied by 1.4, 2.3, 4.1 and 6.4 respectively (excluding capital gains!). Of course the higher bracket income includes income from abroad. It is for this reason that the fraction of total US income growth captured by the top 1% over the 2009-2011 recovery was 121%.<sup>6</sup> The share of national income going to wages and salaries fell to 51.6% in 2006, its lowest recorded level, with data going back to 1929. The share of national income

<sup>4</sup>See Mayer-Foulkes (2009) for this explanation of the 2008 crisis that the simplified model in this article, as well as a more extended model including capital in Mayer-Foulkes (2013), underpin.

<sup>5</sup>Data from "The World Top Incomes Database," <http://topincomes.g-mond.parisschoolofeconomics.eu/>

<sup>6</sup>Data from Excel table TabFig2011prel.xls downloaded from Emmanuel Saez' webpage, April 29, 2013, <http://elsa.berkeley.edu/~saez/atkinson-piketty-saezJEL09series.xls>

captured by corporate profits, in contrast, rose to its highest recorded level, 13.8% (Aron-Dine and Shapiro, 2007).

Let us note that skill biased technological change, the most accepted cause for increased inequality in the US (e.g. Berman, Bound and Machinn 1998), is directly linked to globalization in two ways. First, the outsourcing of labor intensive work raises the proportion of skill intensive work, in itself a skill-biased change in the composition of production technologies. Second, R&D to increase the productivity of the remaining workforce itself also constitutes skill-biased technological change.<sup>7</sup>

Oxfam’s Fuentes-Nieva and Galasso (2014) give an update on the political and social consequences of the worsening degree of global economic inequality. As they state, the “massive concentration of economic resources in the hands of fewer people presents a significant threat to inclusive political and economic systems.” Let us turn to the institutional setting of market power.

**1.2. The institutional deficit under globalization.** An institutional deficit occurs under globalization simply because there is no global government. The global economy can only be governed by the coordinated actions of several governments from the largest economies, as occurred after the 2008 crisis. This tends to render any economic policy under globalization more laissez faire than it would be in a national context.

A central indicator for governance, as well as income redistribution, is taxation. For example, it is quite clear that global governance —the production of global public goods and equity— will require global agreements on taxation. The need for global tax agreements is highlighted by what has happened in their absence. In particular I discuss tax competition and tax havens.

**1.3. Globalization and corporate taxes.** Besides huge profit flows and decreasing interest rates, another notable trend of the last thirty years has been a global decrease of statutory corporate tax rates, see Figure 2. According to Overesch and Rincke (2011), “over the past 25 years, corporate tax rates in Europe show a remarkable downward trend. In 1983, the mean statutory corporate tax rate of 13 Western European countries was 49.2%. As of 2008, the average tax rate of these countries had eroded to 27.2%.” These authors review a series of studies finding support for the tax competition hypothesis for the OECD. They carry out careful econometric estimates that support this same hypothesis, emphasizing that while the short-run impact of tax competition on corporate tax rates may be modest, as countries’ tax systems respond to each other over time, tax competition effects exhibit a significant, long-term multiplier effect.

Establishing the determinants of corporate tax rates is complex. Keen and Konrad (2012) review the theory of tax competition. They point out its achievements as well as complexity, with much remaining to be done. Devereux and Loretz (2012) explain the endogeneity issues in tax competition. Because of transfer pricing, “tax rates based on revenues may contain both the cause (low tax rates) and the consequence (large amount of profits shifted into the country) of tax competition.” Tax competition is particularly strong in the European Union (EU), where the many new, small, member states have provided further impetus to the downward competition. In 2003, the EU Council adopted a voluntary Code of Conduct to combat harmful tax competition.

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<sup>7</sup>Even the World Economic Forum warns that growing income inequality is the biggest risk the world may face within the next 10 years, see <http://rt.com/business/world-economic-forum-inequality-754/>, read January 27th, 2014.

**1.4. Tax havens and the distortion of globalization.** Not only is there an important degree of tax competition across countries, reducing corporate taxes, there is also an important degree of tax evasion. As I mentioned above, an important proportion of FDI profits remains abroad, and the US trade deficit is an indirect indicator of US profits abroad. I also mentioned the \$21 to \$31 trillion dollars in assets held offshore at the end of 2010 (Henry, 2012).

While tax competition has an important impact on firm location, tax havens imply an even more pernicious distortion, favoring international over national production, simply because international production has an easier access to tax avoidance. As international production and value chains develop, tax avoidance provides the incentives to shift domestic production to an international context in which, at least on paper, it can appear to take place beyond the reach of tax officials.

After presenting the globalization model in the following section an application of a tax competition model to its results shows that globalization has a deep impact on the global tax regime and more generally on the institutional balance that can be provided for market power.

## 2. THE GLOBALIZATION MODEL

My objective is to model the process of globalization, understood as trade and foreign direct investment (FDI) between economies with different steady state levels of development. These different levels of development will result either from institutional or from technological differences, included in the same model. The model will explain the main facts of globalization highlighted in the introduction, based on the prominent role of FDI. Globalization:

- (a) Increases aggregate economic growth.
- (b) Increases the economic participation of TNC profits, and lowers worker participation.
- (c) Admits development, underdevelopment and miracle growth.
- (d) Increases inequality in leading countries.
- (e) Leads to lower taxes and more conservative policies through tax competition.

For simplicity I analyze the interaction of two economies, a developed and a less developed economy. These could represent the whole of the developed and underdeveloped world, the US and China, or any underdeveloped country vis a vis the developed world. It can also represent, in a second stage, the set of transnational corporations vis a vis the set of domestic firms. My model in endogenous technological change is based on the multiple contributions of Aghion and Howitt.

Consider two Economies 1 and 2 that produce a continuum of tradeable goods indexed by  $\eta \in [0, 1]$ , where each  $\eta$  refers to a sector. Domestic firms in Economies 1 and 2 have different technological levels  $A_{1t} > A_{2t}$ , representing different levels of development, that change endogenously.

Under autarchy each economy produces the full set of goods. Nevertheless the economies exchange ideas. The more advanced technologies of Economy 1 have a positive impact on technology in Economy 2.

Under trade and FDI (most free trade agreements are also free investment agreements) production sectors  $\eta \in [0, 1]$  fall into three disjoint types. Domestic production and innovation in Economy 1, carried out by Economy 1 innovators, occurs on the subset of sectors  $\Theta_{1t} = [0, \xi_{1t})$ . Likewise domestic production and innovation in Economy 2 occurs in sectors  $\Theta_{2t} = [\xi_{1t}, \xi_{1t} + \xi_{2t})$ . Finally,

FDI occurs on the subset  $\Theta_{FDIt} = [1 - \xi_{FDIt}, 1]$ . The measures of these sectors add up to one:

$$(2.1) \quad |\Theta_{1t}| + |\Theta_{2t}| + |\Theta_{FDIt}| \equiv \xi_{1t} + \xi_{2t} + \xi_{FDIt} = 1.$$

Index the three sector types (domestic sector in Economy 1 or 2, or FDI sector) with  $j \in \{1, 2, FDI\}$ , and refer to the variables  $\xi_{jt}$  as their *number*.

FDI can be modelled in two modes. In the first, corresponding to an initial period of globalization, there is an exogenous subset of sectors  $\Theta_{FDIt} = [1 - \xi_{FDIt}, 1]$  on which it is feasible for innovators from Economy 1 to produce in Economy 2. Using their higher technologies, Economy 1 producers outcompete the Economy 2 domestic sector on the set  $\Theta_{FDIt}$  and obtaining the benefits of cheaper labor. The reverse cannot occur for innovators from Economy 2, since they are not competitive in Economy 1. Because it combines advanced technologies with cheap labor, profits will be higher in the FDI sector. The expansion of  $\xi_{FDIt}$  along time represents a progression of trade and investment agreements and other social arrangements making FDI possible.

The second way to model FDI becomes relevant when new investment possibilities appear for the TNC sector in Economy 1. This second mode corresponds to a second stage of globalization in which every economy has a domestic and a cheap factor seeking FDI sector, and is therefore an Economy 2. Economy 1 will now consist of the sector of transnational corporations, without a population, but with technological level  $A_{1t}$ . Thus the model for the second mode of FDI and globalization is a direct application of the model for the first mode.

I thus construct a simple, two-economy innovation-based growth model with trade and FDI. Innovation occurs as follows. In each economy there is in each sector  $\eta \in [0, 1]$ , a single, infinitely lived innovator who invests in innovation and becomes a national or world monopolist, under autarky or trade, producing in the presence of a competitive fringe. Innovation is cheaper for the producing incumbent than for the competitive fringe, and she therefore has an innovation advantage. Her monopoly therefore persists indefinitely, both in autarky and under trade, so long as her sector is assigned by trade for production in her economy.

The international assignment of production therefore also implies an international assignment of innovation, not only between domestic but also between international producers. In effect this is equivalent to identifying the producer and innovator with the holder of market power over good  $\eta \in [0, 1]$ , even if she subcontracts some of the innovation and production tasks.

In each economy, domestic or FDI knowledge resides in a set of firms, each monopolizing production in some sector  $\eta \in [0, 1]$ . The firms are symmetric and have the same technological level  $A_{1t}$  or  $A_{2t}$  in each type of sector. In the case of domestic firms, these may in addition draw substantial skill inputs from their own economy, at the same technological level  $A_{1t}$  or  $A_{2t}$ . The firm's installations, entrepreneurial skills and the brunt of its skilled workforce all correspond to its technological level  $A_{1t}$  or  $A_{2t}$ . This does not exclude the use of special knowledge inputs at the leading technological level  $A_{1t}$ , incorporated as part of the externality of the leading technological edge.

Innovation requires private inputs. First, the firm's own knowledge inputs we have just described, complemented in the domestic case with local skills, and second, in the form of material inputs. This model uses a variant of Howitt and Mayer-Foulkes' (2005) model of endogenous technological change. For simplicity, innovation occurs with certainty. Next, instead of considering as input

a *public* global nascent leading edge technology, itself formed as an innovation externality, that innovators are implementing in their own line of production, I consider that other firms' nascent *private* leading edge technologies have positive externalities on innovation investment. This has two advantages. First, I do not need to posit an additional variable representing the global stock of leading edge technology. Second, I model a purely private global knowledge system, which concurs with the much more sophisticated knowledge currently used throughout production, which need not be open to the public, and with the diminished current public knowledge system with much less public support for science. Private knowledge cannot be held fully watertight and diffuses through employees, technical advisers, products, and so on, provoking positive externalities from one firm to another. This diffusion accounts for Gerschenkron's (1952) "advantage of backwardness" and generates a force for convergence. It can for example include embodied technological knowledge promoted by suppliers for use in the near future, contracting leading edge technicians to help implement a new level of firm know-how, and so on. By contrast dependence of innovation on the firm's own knowledge and starting point accounts for a "disadvantage of backwardness," and generates a force for divergence.

A scale effect occurs in innovators incentives through the impact of the development of the lagging economy on the relative size of global profits. Since the time scale in which individual firms operate is short compared to the evolution of the global economy, and to avoid the additional variables involved in infinite perfect foresight, I define a myopic decision maker who lets her time horizon tend to zero and only has perfect foresight as  $\Delta t$  goes to zero. This in turn simplifies the scale effect by bringing it to the current time. It is shown that even though FDI obtains extraordinary profits, the fact that this occurs through lower costs reduces its innovation incentives below the incentives for Economy 1 domestic firms. This seems unrealistic in that a transnational corporation with lower technology would soon face international competition from other Economy 1 domestic innovators. Therefore I assume in the first mode of modelling globalization that the FDI innovator decides to innovate at the same rate as Economy 1's domestic innovators for strategic reasons, so as not to fall behind them. Hence both the domestic sector in Economy 1 and the FDI sector maintain the same technological level  $A_{1t}$ . However, strategic considerations and more resources can also eventually allow FDI innovators to outcompete Economy 1 innovators and to find FDI possibilities in Economy 1, thus leading to the second mode of globalization.

To construct the model, we describe production, trade, FDI, and innovation. The reader can find a guide to the model in Figure 3.

**2.1. Production.** Let the population of Economies 1 and 2 be  $\mathcal{L}_{it}$ ,  $i = 1, 2$ . Under autarchy at each time  $t$  two state variables will fully define the state of both economies: the technology levels  $A_{1t}$ ,  $A_{2t}$  of each economy. Under free trade and FDI, the global economy will be fully defined by the state variables,  $\xi_{FDIt}$ ,  $A_{1t}$ , and  $A_{2t}$ .

Let us now turn to the production functions. We consider two inputs, labor and a composite good  $x$  consisting of the combination of all goods  $\eta \in [0, 1]$  according to:

$$(2.2) \quad \ln(x) = \int_0^1 \ln(x(\omega)) d\omega.$$

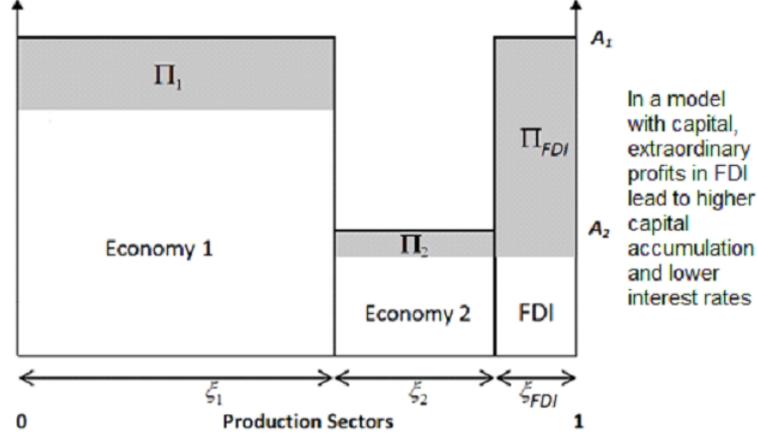


Figure 3. Diagram for the globalization model, showing allocation of production, technology, and FDI across sectors and Economies. Each agent then consumes all goods symmetrically according to her income, implicitly defining trade volumes.

This definition implies that all goods are symmetrically demanded in production according to a Cobb-Douglas function. They will also be symmetrically demanded in consumption. Let the price of the composite good be the numeraire.

**Definition 1.** *The production function in sectors  $\eta \in \Theta_{jt}$  of type  $j \in \{1, 2, FDI\}$  is:*

$$(2.3) \quad y_{jt}(\eta) = [x_{jt}(\eta)]^\alpha [q_j A_{jt} l_{jt}(\eta)]^{1-\alpha}, \quad j \in \{1, 2, FDI\}. \blacksquare$$

Complementing labor with a composite good flow allows for the determination of a wage without introducing an additional state variable such as capital. Here  $y_{jt}(\eta)$  is the quantity produced of good  $\eta \in \Theta_{jt}$ .  $q_j$  is a fixed productivity factor representing the effects of such non-technological factors as geography, institutions and policies that influence a country's total factor productivity (e.g. Acemoglu, Johnson and Robinson, 2001; Acemoglu and Robinson, 2012). This might under certain circumstances differ in the domestic and foreign sectors.  $A_{jt}$  is the technological level in each sector type.  $l_{jt}(\eta)$  is labor employment. The FDI technological level is  $A_{FDIt} = A_{1t}$ .

**Definition 2.** *Define the relative state variables*

$$(2.4) \quad a_t = \frac{A_{2t}}{A_{1t}}, \quad q = \frac{q_2}{q_1}, \quad \bar{q} = \frac{q_2}{q_{FDI}}, \quad \lambda_t = \frac{\mathcal{L}_{2t}}{\mathcal{L}_{1t}}.$$

*For FDI to be viable on sectors  $[1 - \xi_{FDIt}, 1]$  we assume  $q_2 A_{2t} \leq q_{FDI} A_{1t}$ .  $\blacksquare$*

For simplicity we also assume Economy 2 lags behind Economy 1 in its production and innovation institutional characteristics, so  $A_{2t} \leq A_{1t}$ , and  $0 < a_t, q, \bar{q} \leq 1$ .

**2.2. Choice of inputs.** Let  $w_{1t}$ ,  $w_{2t}$  be the domestic wage levels in Economies 1 and 2. The FDI sector also pays labor  $w_{2t}$ , so  $w_{FDIt} = w_{2t}$ . When producers minimize costs, the ratio of composite good input to labor they choose is:

$$(2.5) \quad \frac{x_{jt}(\eta)}{l_{jt}(\eta)} = \frac{\alpha w_{jt}}{1 - \alpha}, \quad j \in \{1, 2, FDI\}.$$

It follows that the production cost  $z_{jt}$  of each unit of good  $\eta \in \Theta_{jt}$  is constant in  $\eta$ ,

$$(2.6) \quad z_{jt} = \frac{(w_{jt}/q_j A_{jt})^{1-\alpha}}{\alpha^\alpha (1-\alpha)^{1-\alpha}}, \quad j \in \{1, 2, FDI\}.$$

Each domestic sector has a competitive fringe that can produce using a lower technological level  $\chi^{-1}A_{jt}$ , with  $\chi > 1$ . This implies domestic producers sell at a price:

$$(2.7) \quad p_{jt} = \chi^{1-\alpha} z_{jt}, \quad j \in \{1, 2\}.$$

Assume now that FDI technologies are beyond the reach of Economy 2 competitive fringe producers, and therefore that the competitive fringe for FDI producers consists of domestic producers in Economy 1. Assume that these are small producers who can trade but cannot afford to produce abroad. It follows that FDI products are sold at the same prices as domestic products in Economy 1.<sup>8</sup> Their price will therefore be given by  $p_{FDIt}(\eta) = \chi^{1-\alpha} z_{1t}(\eta)$ .

Because the production function, wages and prices are constant across sector  $\eta$ , so also are the quantities  $x_{jt}(\eta)$ ,  $l_{jt}(\eta)$ ,  $y_{jt}(\eta)$ , so we can drop the variable  $\eta$  from the notation.

**2.3. Trade and FDI.** Under trade and cheap-factor-seeking FDI, production responds to global demand, and global prices are formed, which in turn determine local wages. Let the instantaneous consumer utility  $U = U(C_t)$  depend on a subutility function  $C_t$  for an agent consuming  $c_t(\eta)$  units of sector  $\eta$  goods,  $\eta \in [0, 1]$ , according to the Cobb-Dougllass function

$$(2.8) \quad \ln(C_t) = \int_0^1 \ln(c_t(\eta)) d\eta.$$

Then the Cobb-Dougllass choice for 1) consumption preferences and 2) the composite good used for production and research inputs, implies aggregate world expenditure across sectors will be constant. It will turn out that prices will also be constant across sectors. Therefore so will production, consumption and input levels of all goods  $\eta \in [0, 1]$ .

Comparative advantage considered as fixed effects in  $\eta$  could be introduced in the model by introducing a fixed sectorial productivity effect that decreased along  $\eta$  for Economy 1 and increased for Economy 2. Then comparative advantage would combine with technological advantage to determine the equilibrium levels of  $\xi_{1t}$ ,  $\xi_{2t}$ . Trade would thus increase aggregate productivity and consequently also makes more resources available for innovation. However, the present model emphasizes the role of FDI, so for the sake of simplicity comparative advantage is not included. We can still imagine there is a small fixed sectorial productivity effect that decreases along  $\eta$  for Economy 1 and increases for Economy 2, so that those sectors allocated for domestic production in Economy 1 lie to the left of those sectors allocated for domestic production in Economy 2.

We now work out how production is allocated across the two economies. The boundary  $\xi_{1t}$  between domestic sectors in Economies 1 and 2 is determined endogenously and would shift to the right or to the left if  $p_{1t}$  were different to  $p_{2t}$  (by attracting more domestic sectors into production in the economy offering the cheaper price) except possibly in the boundary cases  $\xi_{1t} \in \{0, 1 - \xi_{FDIt}\}$ .

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<sup>8</sup>If the price of FDI products were proportional to  $A_{2t}$ , the level of production would become large as  $A_{2t}/A_{1t} \rightarrow 0$  (the case of divergent equilibria, see below) something that seems unrealistic. Intermediate cases with less than full profits could be posed leading to similar results.

Now  $\xi_{1t} > 0$ , because otherwise labor in Economy 1 would not be employed, making  $w_{1t}$  very low and additional production possible, so the only boundary case is  $\xi_{1t} = 1 - \xi_{FDIt}$ , when all labor in Economy 2 is employed in the FDI sector. In this case employment in domestic production in Economy 2 is not competitive with employment in FDI sectors, so there is no domestic supply and there is no price  $p_{2t}$ . Without loss of generality we can set  $p_{2t} = p_{1t}$ .<sup>9</sup> Now similarly  $p_{FDIt}$  cannot be more than  $p_{1t}$ , otherwise FDI sectors would loose their markets to domestic sectors in Economy 1. On the other hand, the competitive fringe for FDI sectors is in Economy 1, so  $p_{FDIt}$  will be at least  $p_{1t}$ . Hence  $p_{FDIt} = p_{1t}$ . It follows that all prices  $p_{1t}$ ,  $p_{2t}$ ,  $p_{FDIt}$  are equal. We can therefore define  $p_t$  by  $p_{1t} = p_{2t} = p_{FDIt} = p_t$ . Now, since each good  $\eta$  has the same price, the cheapest way to produce one unit of composite good is by using one unit of each good  $\eta$ . Hence the cost of one unit of composite good is  $\int_0^1 p_t d\eta = p_t$ . But this is the numeraire, so  $p_t = 1$ . Since expenditure is constant across sectors, it also follows that production quantities are equal. Hence

**Proposition 1.** *Prices and quantities of production are constant across sectors  $\eta$ ,*

$$(2.9) \quad p_{1t} = p_{2t} = p_{FDIt} = 1, \quad y_{1t} = y_{2t} = y_{FDIt} = y_t. \blacksquare$$

Using (2.6) and (2.7) it now follows that

$$(2.10) \quad z_{jt} = \chi^{-(1-\alpha)}, \quad w_{jt} = \frac{\alpha^{1-\alpha} (1-\alpha)}{\chi} q_j A_{jt}, \quad j \in \{1, 2\}.$$

Note therefore that the price and cost of domestic goods is the same in both economies. Since these goods are also produced in the same quantities, the participation of profits, labor and the composite good input are the same,  $w_{1t}l_{1t} = w_{2t}l_{2t}$  and  $x_{1t} = x_{2t}$ . The only difference is that Economy 2 employs more labor at a lower institutional and technological level. In the case of FDI, lower cost lead to a different participation structure.

**Definition 3.** *The cost ratio of FDI to domestic producers in Economy 2 is:*

$$(2.11) \quad b_t \equiv \frac{z_{FDIt}}{z_{2t}} = \left( \frac{w_{2t}/q_{FDI}A_{FDIt}}{w_{2t}/q_2A_{2t}} \right)^{1-\alpha} = (\bar{q}_2 a_t)^{1-\alpha} \leq 1. \blacksquare$$

Now let  $\pi_{jt}$  be the profits in each type of sector  $j \in \{1, 2, FDI\}$ .

**Proposition 2.** *The income participation in each type of production sector is:*

$$(2.12) \quad \pi_{it} = \frac{\chi^{1-\alpha} - 1}{\chi^{1-\alpha}} y_t, \quad x_{it} = \frac{\alpha y_t}{\chi^{1-\alpha}}, \quad w_{it} l_{it} = \frac{(1-\alpha) y_t}{\chi^{1-\alpha}}, \quad i \in \{1, 2\},$$

$$(2.13) \quad \pi_{FDIt} = \frac{\chi^{1-\alpha} - b_t}{\chi^{1-\alpha}} y_t, \quad x_{FDIt} = \frac{\alpha b_t y_t}{\chi^{1-\alpha}}, \quad w_{2t} l_{FDIt} = \frac{(1-\alpha) b_t y_t}{\chi^{1-\alpha}}. \blacksquare$$

We refer to the domestic profit to income ratio  $1 - \chi^{-(1-\alpha)}$ , due to market power generated by innovation, as *normal*. By contrast, the higher profit to income ratio  $1 - b_t \chi^{-(1-\alpha)}$  for FDI is an *extraordinary* profit rate. In particular, it follows from the expressions for labor participation that the labor employment ratios between sector types are:

$$(2.14) \quad \frac{l_{1t}}{l_{2t}} = \frac{w_{2t}}{w_{1t}} = \frac{q_2 A_{2t}}{q_1 A_{1t}} = q a_t, \quad \frac{l_{FDIt}}{l_{2t}} = b_t.$$

<sup>9</sup>Note if all sectors are involved in FDI then wages are not fully defined domestically, and neither is the home technological level. We will assume below that home knowledge does continue to exist and follows the same dynamics, although other analyzes are possible.

To complete the instantaneous description of the economy, observe:

**Remark 1.** *The labor market clearing conditions, setting demand equal to supply, are:*

$$(2.15) \quad \xi_{1t} l_{1t} = L_{1t} = \mathcal{L}_{1t},$$

$$(2.16) \quad \xi_{2t} l_{2t} + \xi_{FDIt} l_{FDIt} = L_{2t} + L_{FDIt} = \mathcal{L}_{2t}.$$

Using (2.14) it follows from these labor market-clearing relations that

$$(2.17) \quad \xi_{1t} = \frac{\mathcal{L}_{1t}}{l_{1t}}, \quad \xi_{2t} + \xi_{FDIt} b_t = qa_t \frac{\mathcal{L}_{2t}}{l_{1t}}.$$

Hence substituting in (2.1),

$$(2.18) \quad \frac{\mathcal{L}_{1t}}{l_{1t}} + qa_t \frac{\mathcal{L}_{2t}}{l_{1t}} + \xi_{FDIt} (1 - b_t) = 1.$$

Define the ‘‘FDI multiplier’’

$$(2.19) \quad \Lambda_{FDIt} = \frac{1}{1 - \xi_{FDIt} (1 - b_t)}.$$

**Proposition 3.** *Employment levels in each type of sector are given by:*

$$(2.20) \quad l_{1t} = (\mathcal{L}_{1t} + qa_t \mathcal{L}_{2t}) \Lambda_{FDIt}, \quad l_{2t} = \frac{l_{1t}}{qa_t}, \quad l_{FDIt} = \frac{b_t l_{1t}}{qa_t}.$$

Hence the domestic sector measures are:

$$(2.21) \quad \xi_{1t} = \frac{1}{(1 + \lambda_t qa_t) \Lambda_{FDIt}}, \quad \xi_{2t} = \frac{\lambda_t qa_t}{(1 + \lambda_t qa_t) \Lambda_{FDIt}} - b_t \xi_{FDIt}. \blacksquare$$

**2.4. Income.** Let gross world product be  $Y_t = \int_0^1 y_t d\eta = y_t$ . Using the expressions for wage participation in (2.12) and (2.3),  $Y_t = [\alpha \chi^{-(1-\alpha)} y_t]^\alpha [q_1 A_{1t} (\mathcal{L}_{1t} + qa_t \mathcal{L}_{2t}) \Lambda_{FDIt}]^{1-\alpha}$ . Solving and rewriting in terms of the basic variables,

$$(2.22) \quad Y_t = \frac{\alpha^{\frac{\alpha}{1-\alpha}}}{\chi^\alpha} \frac{q_1 A_{1t} \mathcal{L}_{1t} + q_2 A_{2t} \mathcal{L}_{2t}}{1 - \xi_{FDIt} (1 - \left[ \frac{q_2 A_{2t}}{q_{FDI} A_{1t}} \right]^{1-\alpha})}.$$

Again using (2.12) and (2.3), the composite input is:

$$(2.23) \quad \begin{aligned} X_t &= \xi_{1t} x_{1t} + \xi_{2t} x_{2t} + \xi_{FDIt} x_{FDIt} = (\xi_{1t} + \xi_{2t} + \xi_{FDIt} b_t) \frac{\alpha y_t}{\chi^{1-\alpha}} \\ &= 1 - \xi_{FDIt} (1 - b_t) = \frac{\alpha y_t}{\Lambda_{FDIt} \chi^{1-\alpha}}. \end{aligned}$$

Hence, writing  $L^G = q_1 A_{1t} \mathcal{L}_{1t} + q_2 A_{2t} \mathcal{L}_{2t}$  for aggregate global labor in efficiency units

**Proposition 4.** *Aggregate global net product is:*

$$(2.24) \quad Y_t - X_t = \left( 1 - \frac{\alpha}{\Lambda_{FDIt} \chi^{1-\alpha}} \right) y_t = \left( \Lambda_{FDIt} - \frac{\alpha}{\chi^{1-\alpha}} \right) L^G. \blacksquare$$

In the absence of FDI, when  $\xi_{FDIt} = 0$ , the FDI multiplier is  $\Lambda_{FDIt} = 1$ . If we set  $\chi = 1$ , net aggregate global product equals the aggregate participation of labor,  $(1 - \alpha) L^G$ . If we now admit ‘‘normal’’ innovation market power  $\chi > 1$ , the distortion introduced through prices in the input ratio between labor and the composite good reduces aggregate output to  $(1 - \frac{\alpha}{\chi^{1-\alpha}}) L^G$ . Now also

admitting FDI, so  $\xi_{FDIt} > 0$ , the use of more advanced technologies in Economy 2 increases gross output by a factor  $\Lambda_{FDIt}$ , the FDI multiplier. However,

**Proposition 5.** *Aggregate global labor income is constant in  $\xi_{FDIt}$ ,*

$$(2.25) \quad W_t = w_{1t}\mathcal{L}_{1t} + w_{2t}\mathcal{L}_{2t} = \frac{\alpha^{\frac{\alpha}{1-\alpha}}}{\chi} (1 - \alpha) L^G.$$

As  $\xi_{FDIt}$  expands, additional product is assigned to profit,

$$(2.26) \quad \Pi_t = Y_t - X_t - W_t = \left( \Lambda_{FDIt} - \frac{\alpha}{\chi^{1-\alpha}} - \frac{\alpha^{\frac{\alpha}{1-\alpha}} (1 - \alpha)}{\chi} \right) L^G. \blacksquare$$

Aggregate product is increasing in the number of FDI sectors and in market power. Wages are decreasing in market power and depend only on the technological levels  $A_{1t}$ ,  $A_{2t}$ .

**2.5. Technological change.** The income distribution and inefficiency we have described for globalization is a consequence of the technological and the institutional lags  $a_t$  and  $\bar{q}_2$ . When underdevelopment is persistent, and we describe these lags as steady state features, then the static equilibrium properties also become steady state features. For example even if  $a^* = 1$ , if there are differences in the fixed productivity factor provided to FDI, so  $q_2 < q_{FDI}$ , then  $b^* < 1$ ,  $\Lambda_{FDI}^* > 1$  implying persistence in the static properties of globalization mentioned above.

Here we show that globalization is also consistent with full divergence in levels (tending to an equilibrium proportional lag) and in growth rates (tending to a lower growth rate).

As mentioned above, in each economy there is in each sector a single, infinitely lived innovator who can produce an innovation for the next period. Observe that sector  $\eta$  will only be in production in one economy, either 1 or 2, because under the equilibrium wages it will have a slight comparative advantage in this economy. Hence it also has a slight advantage for production after innovation, and therefore innovation in sector  $\eta$  will only occur in the economy that produces it.

I consider a myopic innovator who maximizes profits in the short term  $\Delta t$  by choosing innovation inputs. Then I let  $\Delta t \rightarrow 0$  and obtain a continuous time model.

The effectiveness of innovation investment of the sector  $\eta$  entrepreneur will have three components. The first is derived from knowledge and is proportional to the skill level  $S_{jt} = A_{jt}$  that she has been able to accumulate in production, which we assume is the technological level of her firm. This generates a disadvantage of backwardness. The second component consists of positive externalities from the nascent technological edge,  $((1 + \sigma) A_{1t} - A_{jt}) \Delta t$ . The term  $(1 + \sigma) A_{1t}$  represents the nascent technological edge one unit of time later, presenting itself in diverse forms as nascent possibilities, for example embodied in other firm's technologies promoted for use at time  $t + \Delta t$ . The difference measures how far back our innovating firm is from the nascent leading edge. The third component is a material input  $v\Delta t$ . Innovation occurs with certainty combining these components to obtain a technological level  $A_{t+\Delta t}$  according to:

$$(2.27) \quad A_{t+\Delta t} = A_{jt} + \mu_j \left( \frac{((1 + \sigma) A_{1t} - A_{jt}) S_{jt} \Delta t}{A_{1t+\Delta t}} \right)^\beta (v\Delta t)^{1-\beta}, \quad j \in \{1, 2, FDI\}.$$

This means that, as in Howitt and Mayer-Foulkes (2005) the impact of innovator's skill on the technological change that a firm can obtain is proportional first, to the skill level, and second

to its distance to the nascent technological frontier. In additional, this skill impact combines with material inputs according to a Cobb-Douglass function. The parameter  $\mu_j$  represents the innovation productivity of the combined inputs.

Using myopic perfect foresight, so that a given firm correctly expects the new technological levels  $A_{jt+\Delta t}$ , the profits level of an individual firm innovating to a technological level  $A_{t+\Delta t}$  is:

$$(2.28) \quad \pi_{t+\Delta t} = (1 - b_{jt} \left( \frac{A_{jt+\Delta t}}{\chi A_{t+\Delta t}} \right)^{1-\alpha}) y_{t+\Delta t},$$

where  $b_{jt} = 1$  for  $j = 1, 2$  and  $b_{jt} = b_t = (\bar{q}_2 a_t)^{1-\alpha}$  for  $j = FDI$ , since  $\frac{A_{jt+\Delta t}}{A_{t+\Delta t}}$  measures the comparative reduction in costs. Hence the profit maximizing rate of innovation investment is obtained by maximizing:

$$(2.29) \quad \max_v e^{-\delta \Delta t} (1 - b_{jt} \left( \frac{A_{jt+\Delta t}}{\chi A_{t+\Delta t}(v)} \right)^{1-\alpha}) y_{t+\Delta t} - (1 - \phi_j) v \Delta t,$$

where  $e^{-\delta \Delta t}$  is the discount factor, and  $\phi_j \in (0, 1)$  represents an innovation subsidy, a (positive or negative) proxy for all distortions and policies affecting the incentives to innovate. Writing  $A_{t+\Delta t} = A_{jt+\Delta t}$  since firms in sector  $j$  are symmetric ex-post, the first order condition is:

$$\frac{e^{-\delta \Delta t} (1 - \alpha) b_{jt} (\chi^{-1} A_{jt+\Delta t})^{1-\alpha}}{A_{jt+\Delta t}^{2-\alpha}} (1 - \beta) \mu_j \times \left( \frac{((1 + \sigma) A_{1t} - A_{jt}) S_{jt} \Delta t}{A_{1t+\Delta t}} \right)^\beta (v \Delta t)^{-\beta} y_{t+\Delta t} \Delta t = (1 - \phi_j) \Delta t.$$

Letting  $\bar{\mu}_j = \frac{(1-\alpha)(1-\beta)}{\chi^{1-\alpha}(1-\phi_j)} \mu_j$ , material inputs  $v$  are given by:

$$(v \Delta t)^\beta = e^{-\delta \Delta t} b_{jt} \bar{\mu}_j \left( \frac{((1 + \sigma) A_{1t} - A_{jt}) S_{jt} \Delta t}{A_{1t+\Delta t}} \right)^\beta \frac{y_{t+\Delta t}}{A_{1t+\Delta t}},$$

Note that FDI firms have *lower* incentives to innovate even though their profits are higher, because they face *lower costs*. This holds so long as strategic competition with Economy 1 firms is not considered. As mentioned before, we therefore assume for the first mode of globalization that FDI firms decide to innovate at the same rate as Economy 1 domestic firms, keeping  $A_{FDIt} = A_{1t}$ . Thus we now only consider profit maximization by domestic innovators in both economies,

$$(2.30) \quad A_{t+\Delta t} = A_{jt} + \mu_j \left( \frac{((1 + \sigma) A_{1t} - A_{jt}) S_{jt} \Delta t}{A_{1t+\Delta t}} \right) \left( e^{-\delta \Delta t} \bar{\mu}_j \frac{y_{t+\Delta t}}{A_{1t+\Delta t}} \right)^{\frac{1-\beta}{\beta}}, \quad j \in \{1, 2\}.$$

Note also that since  $y_{t+1}$  depends on  $a_t$  a relative scale effects is introduced that complicates the dynamics. This aspect is simplified by using continuous myopic foresight. Now set:

$$(2.31) \quad \tilde{\mu}_j = \mu_j \bar{\mu}_j^{\frac{1-\beta}{\beta}} = \left( \frac{(1-\alpha)(1-\beta)}{\chi^{1-\alpha}(1-\phi_j)} \right)^{\frac{1-\beta}{\beta}} \mu_j^{\frac{1}{\beta}},$$

noting that this final innovativity parameter for each economy is *decreasing* in market power  $\chi$ , because, as can be seen by following the derivative above, the higher the market power, the relatively lower the input costs and therefore the lower the impact of technological improvement on profit.

Taking the limit as  $\Delta t \rightarrow 0$ , and writing  $A_{t+\Delta t} = A_{jt+\Delta t}$ ,

$$(2.32) \quad \dot{A}_{jt} = \tilde{\mu}_j \frac{(1+\sigma)A_{1t} - A_{jt}}{A_{1t}} A_{jt} \Upsilon(a_t)^{\frac{1-\beta}{\beta}}, \quad j \in \{1, 2\}.$$

where

$$(2.33) \quad \Upsilon(a_t) = \frac{y_t}{A_{1t}} = \frac{\alpha^{\frac{\alpha}{1-\alpha}}}{\chi^\alpha} [q_1 (\mathcal{L}_{1t} + qa_t \mathcal{L}_{2t}) \Lambda_{FDIt}],$$

The case  $j = 1$  yields the rate of growth of technology in Economy 1,

$$(2.34) \quad \frac{\dot{A}_{1t}}{A_{1t}} = \sigma \tilde{\mu}_1 \Upsilon(a_t)^{\frac{1-\beta}{\beta}}.$$

This gives a bounded scale effect for the global growth rate that depends on the size of the global economy relative to  $A_{1t}$ . In Economy 2,

$$(2.35) \quad \frac{\dot{A}_{2t}}{A_{2t}} = \tilde{\mu}_2 (1 + \sigma - a_t) \Upsilon(a_t)^{\frac{1-\beta}{\beta}},$$

Hence the rate of growth of the relative technological level  $a_t$  is:

$$(2.36) \quad \frac{\dot{a}_t}{a_t} = (\tilde{\mu}_2 (1 + \sigma - a_t) - \tilde{\mu}_1 \sigma) \Upsilon(a_t)^{\frac{1-\beta}{\beta}}.$$

We can now describe the technological dynamics.

**Proposition 6.** *Economy 1's technological level  $A_{1t}$  grows at a rate  $g(a_t) = \sigma \tilde{\mu}_1 \Upsilon(a_t)^{\frac{1-\beta}{\beta}}$  that depends on the size of the global economy relative to  $A_{1t}$ , and is increasing in  $\xi_{FDIt}$ . Economy 2 diverges in growth rates with Economy 1 if  $\tilde{\mu}_2 < \frac{\sigma}{1+\sigma} \tilde{\mu}_1$ ; diverges in levels converging to a steady state  $a^* = 1 + \sigma - \frac{\tilde{\mu}_1}{\tilde{\mu}_2} \sigma$  if  $\tilde{\mu}_2 \in [\frac{\sigma}{1+\sigma} \tilde{\mu}_1, \tilde{\mu}_1]$ ; and overtakes Economy 1 if  $\tilde{\mu}_2 > \tilde{\mu}_1$ .*

Proof. Note that  $\tilde{\mu}_2 (1 + \sigma - a_t) - \tilde{\mu}_1 \sigma$  is decreasing in  $a_t$  and equal to  $(\tilde{\mu}_2 - \tilde{\mu}_1) \sigma$  at  $a_t = 1$ . Thus Economy 2 overtakes Economy 1 if  $\tilde{\mu}_2 > \tilde{\mu}_1$ . On the other hand the same expression is negative at  $a_t = 0$  if  $\tilde{\mu}_2 (1 + \sigma) - \tilde{\mu}_1 \sigma < 0$ , that is, if  $\tilde{\mu}_2 < \frac{\sigma}{1+\sigma} \tilde{\mu}_1$ . Hence under this condition Economy 2 diverges in growth rates with Economy 1, with

$$(2.37) \quad \lim_{t \rightarrow \infty} \frac{\dot{A}_{2t}}{A_{2t}} = \tilde{\mu}_2 (1 + \sigma) \Upsilon(0)^{\frac{1-\beta}{\beta}} < \lim_{t \rightarrow \infty} \frac{\dot{A}_{1t}}{A_{1t}} = \tilde{\mu}_1 \sigma \Upsilon(0)^{\frac{1-\beta}{\beta}}.$$

In the intermediate cases Economy 2 diverges in levels with Economy 1, to the given steady state. ■

**2.6. Transnational corporations as leading sector.** Since TNCs have higher resources than domestic Economy 1 firms, even though their incentives for innovation derived from the cost structure in Economy 2 are lower, they have strategic incentives to innovate more than domestic firms in Economy 1, to be able to take over more sectors of production. These firms will have integrated production structures (e.g. Baldwin, 2012), allowing their operations in advanced economies to take on the characteristics of FDI, perhaps employing cheap human capital rather than cheap unskilled labor. In addition, they will dedicate economic and political resources to increasing  $\xi_{FDIt}$ . Non-equity modes of investment are an example of a new way to expand FDI (UNCTAD, 2013).

Thus we now consider the case when TNCs as a set constitute the leading knowledge system and can therefore be considered as Economy 1. We analyze the relation between the TNC sector and a typical country, which constitutes Economy 2, whose own innovation sectors are located in

corporations only working domestically. Economy 1 does not have a population, so  $\mathcal{L}_{1t} = 0$  and  $\xi_{1t} = 0$ . Instead it employs labor in the FDI sector of Economy 2.

Again using (2.12), (2.3), it now follows  $\frac{l_{FDIt}}{l_{2t}} = b_t$  as before, so:

$$(2.38) \quad \xi_{2t}l_{2t} + \xi_{FDIt}l_{FDIt} = L_{2t} + L_{FDIt} = \mathcal{L}_{2t},$$

$$(2.39) \quad \xi_{2t} + \xi_{FDIt}b_t = \frac{\mathcal{L}_{2t}}{l_{2t}}.$$

Since  $\xi_{2t} + \xi_{FDIt} = 1$ ,  $\frac{\mathcal{L}_{2t}}{l_{2t}} + \xi_{FDIt}(1 - b_t) = 1$  and  $l_{2t} = \mathcal{L}_{2t}\Lambda_{FDIt}$ . Income can now be calculated, yielding  $Y_t = \alpha^{\frac{1}{1-\alpha}}\chi^{-\alpha}q_2A_{2t}\mathcal{L}_{2t}\Lambda_{FDIt}$ . Equations (2.22) to (2.26) now hold with  $\mathcal{L}_{1t} = 0$ .

**2.7. The participation of profits in income.** The income participation ratio between profits and wages is an indicator of income distribution and of the relative political impact of these two sectors in the determination of policy. Using income participations (2.12) and (2.13) the following ratios are obtained. The income participation ratio between profits and wages under autarchy or in the domestic sectors of Economy 1 and 2 is:

$$(2.40) \quad R_{it} \equiv \frac{\pi_{it}}{w_{it}l_{it}} = \frac{\chi^{1-\alpha} - 1}{1 - \alpha}, \quad i \in \{1, 2\}.$$

In the FDI sector of Economy 2 the ratio is:

$$(2.41) \quad R_t^{FDI} \equiv \frac{\pi_{FDIt}}{w_{2t}l_{FDIt}} = \frac{\chi^{1-\alpha} - b_t}{1 - \alpha}.$$

The profit to wages ratio in Economies 1 or 2, including FDI innovators with weight  $\psi^1$  or  $\psi^2$  is:

$$(2.42) \quad R_t^1 \equiv \frac{\xi_{1t}\pi_{1t} + \psi^1\xi_{FDIt}\pi_{FDIt}}{\xi_{1t}w_{1t}l_{1t}} = \frac{\chi^{1-\alpha} - 1 + \psi^1\frac{\xi_{FDIt}}{\xi_{1t}}(\chi^{1-\alpha} - b_t)}{1 - \alpha},$$

$$(2.43) \quad R_t^2 \equiv \frac{\xi_{2t}\pi_{2t} + \psi^2\xi_{FDIt}\pi_{FDIt}}{(\xi_{2t} + \xi_{FDIt})w_{2t}l_{2t}} = \frac{\chi^{1-\alpha} - 1 + \psi^2\frac{\xi_{FDIt}}{\xi_{2t}}(\chi^{1-\alpha} - b_t)}{(1 + \frac{\xi_{FDIt}}{\xi_{2t}})(1 - \alpha)}.$$

The global profit to wages income participation ratio is:

$$(2.44) \quad R_t^G \equiv \frac{\xi_{1t}\pi_{1t} + \xi_{2t}\pi_{2t} + \xi_{FDIt}\pi_{FDIt}}{\xi_{1t}w_{1t}l_{1t} + \xi_{2t}w_{2t}l_{2t}} = \frac{\chi^{1-\alpha} - 1 + \frac{\xi_{FDIt}}{\xi_{1t} + \xi_{2t}}(\chi^{1-\alpha} - b_t)}{1 - \alpha}.$$

**Definition 4.** An influential allocation of FDI profits across Economies 1 and 2 is one for which  $\psi^1 > 0$ ,  $\psi^2 > \frac{\chi^{1-\alpha}-1}{\chi^{1-\alpha}-b_t}$ , and  $\psi^1 + \psi^2 < 1$ . ■

Since  $\frac{\chi^{1-\alpha}-1}{\chi^{1-\alpha}-b_t} < 1$ , influential allocations exist. The meaning of this is the following.

**Proposition 7.** Under an influential allocation of profits, the profit to wage ratio is higher under FDI in both Economies and in the global economy than under autarchy or trade in the original economies:

$$(2.45) \quad R_{it} < R_t^j, \quad i \in \{1, 2\}, \quad i \in \{1, 2, G\}. \quad \blacksquare$$

### 3. MODELLING THE INSTITUTIONAL DEFICIT

Much of the institutional debate focuses on economic rules of the game such as property rights, and the capacity to provide productive infrastructure, included in  $q_j$  above. Here I focus on institutions

that can address the problems posed by market power, including problems in efficiency, equity and responsibility. Western countries have traditionally held corporations accountable before the law, regulating and taxing them quite considerably during the postwar period of prosperity. Addressing global market power clearly requires the capacity to control and tax TNCs.

The theory of international tax competition considers decision makers who maximize objective functions that differ from the social welfare (Keen and Konrad, 2012). These objective functions can represent selfish dictators, or the impact of the political process, as in the case of representative government with lobbying for tax rate choices. For our purposes here, I shall assume that corporate taxes are defined through such an optimization process, therefore including a plutocratic impact. Now, this or an extended optimization process, simultaneously defines tax levels for labor. For example, Wachtel (2002) reports that while corporate taxes decreased in the US and the EU, labor taxes simultaneously increased.

I next assume that the welfare optimization involves first maximizing production and then distributing it. Therefore I can assume for simplicity that there is agreement between the various actors on the optimal levels of productive infrastructure and other public services, eschewing any discussion of competition between the domestic and FDI sectors through the assignment of productive resources. What remains is determining what adjustment will be made using taxes to the distribution of income and the regulatory environment, and so on.

Under these simplifying assumptions I can measure the institutional capability for optimizing the role of corporate market power in society by the tax levels that result from an optimization process as just described, that are dedicated to transferring income from domestic and TNC profits to various social uses.

Alternatively, this “tax rate” can be considered as a “political will” function for reducing the negative impacts of market power, a process which is costly for corporations. Let us call this the “market power tax” MPT. I assume a closed form solution exists for this function, that depends negatively on the number of countries competing, and on the resources that domestic and transnational corporations have, compared to labor, to lobby for a lower MPT.

Here we can consider the following cases. First, autarky. Second, trade without FDI. Third, trade and FDI with two tax competitions going on, one between  $m_1$  identical leading countries, jointly comprising Economy 1, and another between  $m_2$  identical lagging countries jointly comprising Economy 2. Finally, globalization when Economy 1 is the set of TNCs and there are  $m_2$  identical countries. In each of the two types of countries I assume that the resulting equilibrium tax or political will is a function

$$(3.1) \quad MPT_i = MPT_i(m_i, R), \quad i = 1, 2.$$

(-) (-)

of the number of countries  $m_j$  involved in the tax competition and of the profit to wage participation ratio  $R$ . Countries of each type are identical and have a characteristic function  $MPT_i$ .

Using the notation in section (2.7) and the results of Proposition (2.7) it follows that

**Proposition 8.** *For both types of Economies 1 and 2, equilibrium market power taxes under autarky are higher than under trade, and these in turn are higher than under trade and FDI, this*

last under an influential allocation of FDI profits:

$$(3.2) \quad MPT_i(1, R_{it}) > MPT_i(m_i, R_{it}) > MPT_i(m_i, R_t^i), \quad i \in \{1, 2\}.$$

In the case when TNCs form the leading sector, the result for Economy 2 holds for all economies. Also, equilibrium market power taxes desired by the domestic sector in Economy 2 are higher than those desired by the FDI sector,  $MPT_2(1, R_t^2) > MPT_2(1, R_t^{FDI})$ .

Finally, under FDI the equilibrium market power tax desired globally is lower than that desired under just trade in Economies 1 or 2,  $MPT_i(m_i, R_{it}) > MPT_i(m_i, R_t^G)$ , where we assume the global polity is consistent with (3.1) in that  $MPT_i(m_i, R) > MPT^G(m_1 + m_2, R)$ ,  $i = 1, 2$ .

Thus in every case, under an influential allocation of FDI profits, to be able to reproduce the original market power balance, national and global polities must wield a stronger political will than the original polities of Economy 1 or Economy 2. ■

It must be understood that a sufficient unwillingness to tax market power entails a weakening of democracy. Fuentes-Nieva and Galasso (2014) explain how this is in fact occurring through widespread political capture favoring the wealthy, that is presenting a real threat to inclusive political and economic systems. The model provided here explains the broad economic and political global reality described by these authors.

In addition, so long as TNC profits have access to tax avoidance, a distorted assignment of production will result, with domestic production and the corporate tax base eroding as they shift to international production.

The issue of global taxation is slowly but surely rising to the forefront. See Picciotto (2012) for details on a unitary taxation scheme for TNCs. Conconi et al. (2008) propose the introduction of a single EU corporate tax. Mayer-Foulkes (2009) proposes a harmonization of TNC taxes.

#### 4. CONCLUSIONS

The model demonstrates that the main facts highlighted above about globalization can be understood as the result of factor exchange between economies at different levels of development. This simple hypothesis is enough to understand that globalization:

- (a) Increases aggregate economic growth (see Proposition 6);
- (b) Increases the economic participation of TNC profits, and lowers worker participation (Propositions 5 and 7).
- (c) Is logically consistent with development, underdevelopment and miracle growth (see Proposition 6, miracle growth occurring when a structural reform significantly increases  $\tilde{\mu}_2$ ).
- (d) Increases inequality in leading countries (Proposition 7).
- (e) Leads to lower taxes and more conservative policies through tax competition, given that TNCs act strategically across economies (Proposition 8).

The model also shows that if the innovativity of the competitive fringe rise, so that market power  $\chi$  is reduced, the participation of wages rises, production is more efficient (Propositions 4 and 5), and innovativity  $\tilde{\mu}_2$  rises as well, as commented after equation (2.31). Thus the model upholds Adam Smith's result that market power diminishes welfare, but does not assume profits are zero.

Market power is not a matter of assumption. Both profits and persistent underdevelopment are a stubborn part of reality. They do not disappear under *laissez faire*, much to the contrary. Moreover, the model shows that these two are linked: it is precisely underdevelopment, as the persistent determinant of low FDI host-country technology and wages, that gives rise to increased TNC market power. In addition, profits are ubiquitous not only in underdeveloped but also in developed economies: perfect competition does not describe economies with a vibrant innovation. Theories that do not explain the existence of both profits and underdevelopment cannot explain the main facts and challenges of globalization.<sup>10</sup>

The model shows that under globalization increased TNC market power is as persistent as underdevelopment, and that it increases economic and political inequality everywhere, weakening national as well as international governance and democracy. One essential policy for meeting the twin global challenge of market power and underdevelopment is to harmonize global corporate taxes and use the proceeds for sustainable economic development everywhere.

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<sup>10</sup>This includes models that assume away the existence of profits, such as trade models under perfect equilibrium, or models with a free entry hypothesis leading to zero profits. In a related topic, Mayer-Foulkes (2011) proves that finance and threats can produce market power for profit where perfect competition would otherwise hold.

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