INTRODUCTION

In recent times, we have witnessed the emergence of a vast literature on development models inspired, fundamentally, by the experiences of several Southeast Asian countries, but whose conclusions have been extended to formulate policy prescriptions for Latin American countries. This standpoint, known as “New-Structuralism”\(^1\) (henceforth, NS), views the real exchange rate as the key variable to achieve...

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\(^1\)This term has been employed in the literature in a broader sense: it refers to the contributions of the Economic Commission for Latin American and the Caribbean (ECLAC) in different fields of economics, from the 1990 onwards (structural reforms, globalization, innovation, macroeconomic volatility, etc.; for a revision of this literature, see Bielschowsky, 2009). Here, however, we will only discuss those works that, following ECLAC’s tradition, explore the link between exchange rate policy and economic growth.
sustained economic growth. Although the transmission channels from the former to the latter are discussed in a wide variety of models, here we will focus on the dual-economy models for small, open countries with persistent unemployment, firstly presented in Frenkel and Ros (2006), and then more rigorously developed, among others, by Razmi, Rapetti, and Skott (2012), Rapetti (2013), and Neto and Lima (2017).²

Inspired by Lewis’ (1954) seminal contribution, these models identify two strikingly different productive sectors within a peripheral economy: a sector that profitably exports part of its production at currently given international prices (sector $T$, or the “tradable sector”) and a second sector of low productivity, which sells its entire production in the domestic market (sector $NT$, or the “non-tradable” sector). A central feature behind the new-structuralist argument is that sector $T$, typically a modern industrial sector, is envisaged as the most dynamic sector in terms of innovation and productivity growth, with the implication that it should be the sector heavily promoted by the government.

There are three main channels discussed by this literature through which depreciations may foster growth. In the “short run”, a rise in the exchange rate would have expansionary effects on employment and exports of sector $T$. In the medium run, the increase in the relative profitability of industry $T$ would induce a rise of its share in output, and thereby, being the most dynamic sector, average productivity would be raised too. And finally, in the long run, the higher average profit rate would trigger a profit-led-growth path.

To these three main mechanisms, we can add a fourth expansionary channel, which is assumed to work both in the medium and long runs. It rests on the possibility to diversify the existing productive structure by incorporating new sectors that were not profitable before devaluation.³

Now, while the results of these models are supported by an important empirical literature, the fact is that the evidence is far from conclusive. In the first place, there are difficulties with the identification of the “equilibrium” or “long-run” level of the exchange rate, against which the observed misalignments are computed. The usual procedures, to rely either on some “adjusted purchasing-power-parity” index (see e.g., Missio, Jayme, Britto, & Luis Oreiro, 2015; Razmi et al., 2012; Rodrik, 2008) or on some other measure that depends on “fundamentals” (e.g., Razin & Collins, 1997) are far from being universally accepted (see Nouira & Sekkat, 2012; Smithin, 2002, Woodford, 2008). Other contributions adopt not less questionable methods. In Levy-Yeyati and Sturzenegger (2007), just to mention another empirical work usually quoted in defense of the positive relationship between the real exchange rate and economic growth, undervaluation is proxied counterfactually by the notion of “fear of floating”. It denotes the idea that the exchange rate is artificially kept above its market equilibrium level through the interventions of the Central Bank in the foreign exchange market. In this case, the authors are unable to capture the effective impact of devaluation. They can only measure the effect of an intervention that attempts to avoid the appreciation of the domestic currency, while, at the same time, they use the change in the level of international reserves as a proxy of the hypothetical movement of the exchange rate. Clearly, however, the rise in the level of international reserves can be the

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² Ros and Skott (1998) could be also included in this list, but their model is employed to examine the effects of trade liberalization on growth, and not of devaluation per se. For a different kind of model used to support a positive relation between the real exchange and growth, which will not be examined here, see for example, La Marca (2010), Razmi (2012) and Tadeu Lima and Porcile (2013).

³ There is a fifth channel, not discussed by these authors, that examines the impact of devaluation on net exports. This channel, certainly popular within mainstream circles, assumes that price elasticities of both exports and imports satisfy the Marshall–Lerner condition. Differently from the above-mentioned channels, this mechanism assumes that the economy is “big” (i.e., it determines the international price of its exports); moreover, it is also assumed that the action of the channel is limited to the short run, since only within this time span, it is further argued, there is involuntary unemployment. While in the long run, the exchange rate is assumed to adjust to its general equilibrium level.
outcome of multiple reasons, such as the inflow of capitals due to the very same dynamic of growth, which may, therefore, be a source of endogeneity bias.

Moreover, the empirical evidence provided by the “favourable” works should be qualified, since the relation is subject to non-linearities that either show that (a) only moderate depreciations accelerate growth, while large ones tend to reduce it (Aguirre & Calderón, 2005; Couharde & Sallenave, 2013); or (b) the effect of changes in the exchange rate depends on the kind of regime considered (Mejía-Reyes, Osborn, & Sensier, 2010): while appreciation regimes are detrimental to growth, the effect of undervaluation is indeterminate.4

Lastly, beyond the seminal contributions that document the contractionary effects of devaluation in developing countries (Braun & Joy, 1968; Diaz Alejandro, 1963; Krugman & Taylor, 1978), there is also a more recent literature that finds evidence in this direction, both in the short and long runs (Ahmed, 2003; Kim, An, & Kim, 2015; López, Sanchez, & Spanos, 2011; Mitchell & Pentecost, 2001; Miteza, 2006; Oskooee & Miteza, 2006; Serena & Sousa, 2017), that obtains indeterminate results, that depend on the groups of countries and/or the period of time considered (Oskooee & Hajilee, 2010), or simply that, beyond the observed correlation in the short run, finds no relation whatsoever in the long run (Acar, 2000; Chou & Chao, 2001; Goncalves & Rodrigues, 2017; Kamin & Klau, 1997; Nouira & Sekkat, 2012; Oskooee & Kandil, 2011; Upadhaya, 1999).

The indeterminacy of empirical results should not, however, be a cause of surprise. Since outside the neoclassical (or marginal) approach, it does not seem possible to obtain general relations between relative prices and the dynamics of quantities, which is, on the other hand, precisely what NS is trying to establish through its transmission channels.

On the other hand, these models do not seem to fit very well with Latin American countries, whose most profitable sector produces primary commodities or manufactures based on primary inputs; and under conditions that, even some authors that broadly speaking also belong to NS, qualify as “extremely favourable”, and hence, “yield Ricardian [differential] rents” (Bresser Pereira, 2008, pp. 53–55).5 While, due to an incomplete process of import substitution inherited from the past, the industrial sector is a backward sector that, if any, can only produce for the domestic market.6

To have just a quick glance at this feature, we can examine the composition of exports of Latin American countries and the Caribbean. As it can be seen in Chart 1, currently 52% of total exports of the region to the rest of the world are explained by primary commodities or manufactures based on primary goods. Moreover, if the case of Mexico is excluded due to the peculiarities of the “Maquila”, and we focus on South America, which concentrates the remaining major countries of the region, this percentage rises to 86. Far from being a circumstantial feature, the predominance of primary goods in the export baskets of Latin American countries is a persistent structural characteristic that has survived over the last decades. In the period 1985–2002, 59% of total exports of the main economies of the region (Argentina, Bolivia, Brazil, Chile, Colombia, Mexico, Peru and Uruguay) were based on natural resources, while, for instance, it was only 30% in the developing Asian countries that has inspired NS.

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4 That non-linearities are sufficiently damaging for the approach is even accepted by some of its proponents (see the contribution by Tadeu Lima jointly with Marques Ribeiro and McCombie (2017, pp. 2, 3).

5 See also Guzmán, Ocampo, and Stiglitz (2018, p. 53), who accept that “[m]any developing economies, especially in Africa and South America, are highly dependent on agricultural and/or nonrenewable natural resource exports (fuels and minerals)”.

6 Actually, this kind of pattern of specialization seems to have also been recently accepted even by some representative scholars of NS examined here: “The region [Latin America] has experienced a reduction in its capacity to produce tradable goods other than commodities … The region was de-industrialized, and to reverse this process will take time” (Damill & Frenkel, 2017, p. 5).
If the mixed empirical evidence suggests that the transmission channels adduced by NS are not sufficiently robust, and calls for a thorough revision of the issue, the inadequacy of these models to represent Latin American countries suggests that the analytical framework employed, although it must respect the main features of the canonical model used by NS, should be also sufficiently flexible to accommodate different productive structures. To this end, after this introduction, in Section 2 we present a model that determines the pattern of trade as a problem of technical choices, and of which the productive structure assumed by NS emerges only as a special case. On this basis, in Section 3 we critically examine the transmission channels adduced by NS “in their own terms”, namely assuming the same productive structure as the authors of the approach. While in Section 4, we discuss further limits of these channels when the pattern of trade is more suitable to represent Latin American countries. Section 5 resumes the argument and presents the main conclusions of the article, which can be very briefly summarized in the following statement: new-structuralist channels work only under highly restrictive assumptions, and therefore the kind of relationship between real exchange rate and growth cannot be generally ascertained.

2 | ANALYTICAL FRAMEWORK

In this section, we introduce a formal framework that captures the main features of the dual-economy model firstly presented in Frenkel and Ros (2006), and then developed, among others, by Razmi et al. (2012), Rapetti (2013), and Neto and Lima (2017). Therefore, we conceive a small (i.e., price taking) peripheral economy opened to trade and capital flows, which also has persistent unemployment.

The productive structure is characterized by the following features: first, there is an intrinsically non-tradable good, $NT$, typically subsistence agriculture or services; second, there is one tradable commodity, $T$. However, to explore the robustness of the transmission channels from the real exchange rate to economic growth adduced by NS on different productive structures, we assume, differently from the above-mentioned contributions, that the nature of good $T$ is not predetermined, but rather...
is, as we shall see, the outcome of a problem of technical choices. As a result, commodity \( T \) can be either a necessary primary consumption good (such as corn)—eventually produced under conditions of differential rent—or a more dynamic industrial good. Let us call the former commodity \( C \) and the latter commodity \( I \).

We also follow NS in assuming that commodity \( T \) is produced by direct labour and an imported capital good.\(^7\) To avoid the problems raised by fixed capital, which are not relevant for the present analysis, for simplicity we further assume the capital good to be entirely circulating. Commodity \( NT \), on the other hand, requires unassisted labour alone.

If \( w \) stands for the uniform nominal wage rate across sectors, \( r \) for the normal rate of profits, \( l_{NT} \) and \( l_T \) (with \( T = C, I \)) are the unitary labour requirements of sectors \( NT \) and \( T \), \( k_T \) is the unitary requirement of the capital good \( K \)\(^8\) in sector \( T \), \( p^*_K \) is its exogenously given price, and \( E \) is the nominal exchange rate, then the costs of production or the \textit{supply prices} of commodities \( NT \) (\( p^s_{NT} \)) and \( T \) (\( p^s_T \)) can be represented by the following equations:\(^9\)

\[
  p^s_{NT} = w l_{NT} (1 + r) \tag{1}
\]

\[
  p^s_T = (w l_T + k_T E p^*_K) (1 + r) \quad (T = C, I) \tag{2}
\]

These supply prices represent the minimum amount of money per unit of output to regularly (under “normal conditions”) deliver each commodity on the market.

For reasons that will be clear below, here we slightly depart from NS and explicitly introduce a second notion of price, which we shall denominate \textit{demand} or \textit{selling price}. It represents the maximum amount of money that consumers are willing to pay for a certain commodity. If, like the authors of the approach, we abstract from transport costs, import tariffs and other expenses implied by international trade, we should notice that, since the domestic economy takes the international price of the tradable good (\( p^*_T \)) as given, once the level of the exchange rate is fixed, demand prices for tradable goods \( T = C, I \) are univocally determined. These prices are:

\[
  p^d_T = E p^*_T \quad (T = C, I) \tag{3}
\]

\(^7\) Except for Razmi et al. (2012, p. 152), who explicitly argue that “all capital goods are imported”, the remaining papers examined here do not explicitly mention where capital goods are produced. At any rate, Frenkel and Ros (2006, p. 635) eventually accept that domestic production requires “an important portion of imported capital goods”, and Rapetti (2013, p. 2) similarly points out that in development countries, imports of capital goods may be “significant”. Anyway, the domestic production of capital goods will be considered in Section 3.

\(^8\) When good \( T \) is a primary commodity, it will also use land as an input. However, throughout the analysis we will abstract from absolute rent, while the possibility and implications of differential rent will be explored in Section 4.

\(^9\) Differently from Lewis’ (1954) model that has inspired it, NS assumes the uniformity of money wage rates across sectors, and that is why we adopt the same assumption here. We thank a comment made by an anonymous referee that allowed us to clarify the issue.

\(^10\) The assumption that both tradable sectors employ the same capital good is no doubt restrictive. However, this is immaterial to the results reached in the paper and can be anyway easily relaxed when necessary.

\(^11\) Since the scope of this section is only to determine prices and distribution within new-structuralist “canonical” model, for the moment we assume \textit{given} sectorial outputs, and therefore the technical coefficients are expressed per unit of output. The discussion of the effects of income distribution on the change in the level of outputs, and the related question of the kind of returns assumed by NS (both of scale and marginal ones) will be postponed to the following section, when the alleged channels that link the exchange rate and economic growth are examined in detail.
While for the non-tradable commodity, the demand price is determined by its respective supply price, as it is the case with any commodity produced in a closed economy:\(^{12}\):

\[ p_{NT}^d = p_{NT}^s \]  

(4)

The six Equation (1)–(2C, 2I)–(3C, 3I)–(4) have nine unknowns: \( E, r, w, p_{NT}^s, p_{T, T, T}^1, p_{T, T, C}^C, p_{NT}^d, p_{T, T, T}^d, p_{T, T, C}^d \). Therefore, there are three degrees of freedom left. To eliminate the first two of them, consider first that NS assumes that, due to “nominal stickiness” (e.g., wage contracts are the result of previous negotiations between workers and capitalists), the level of money wages is given, at least in what NS calls the “short run” (see Rapetti, 2013, p. 11)\(^{13}\):

\[ w = \bar{w} \]  

(5)

Second, that the nominal exchange rate is determined by the monetary authority (Rapetti, 2013, p. 11)\(^{14}\):

\[ E = E \]  

(6)

This implies that the wage rate expressed in foreign currency (which is none other than the inverse of the \( E/w \) ratio) is independent from market conditions and can therefore be known before prices and distribution are determined. If we define the variable \( e \equiv E/w \), then (5) and (6) imply:

\[ e = \bar{e} = \frac{E}{\bar{w}} \]  

(7)

To eliminate the last degree of freedom, one must determine the pattern of specialization in the tradable sector. Notice however that in our model, differently from the one endorsed by NS, it is not possible to ascertain which of the tradable commodities will be effectively produced before the relationship between demand and supply prices of each of these commodities is established. Hence, before income distribution is known.

The pattern of specialization of the economy will be regulated by the following conditions:

\[ p_T^d \leq p_T^s \quad (T = C, I) \]  

(8)

\(^{12}\)In Rapetti’s (2013) model, for instance, the supply price Equations (1) and (2) are not explicitly formalized, but one can derive them from his Equations (3) and (6). While our Equation (3) corresponds to Rapetti’s Equation (2).

\(^{13}\)This fact does not imply that for NS, over longer time spans the nominal wage adjusts to clear the labor market. It simply means that eventually the level of money wages change because they are renegotiated according to new market and institutional conditions. This view of the institutional determinants of the level of wages is clearly stated when Rapetti (2013, pp. 16, 17) recalls that wage determination is influenced by two factors: besides workers' bargaining power vis-à-vis capitalists, “wages are also influenced by institutional, political and moral elements which are context dependent and can be influenced by government intervention”. This implies that, even over longer periods, we are authorized to take \( w \) as given when determining prices and distribution.

\(^{14}\)\( E \) is defined as the amount of domestic currency per unit of foreign currency, which means that \( E \) goes up with a depreciation of the local currency.
The generic tradable commodity $T$ will be produced and (potentially) exported only if $p^d_T = p^s_T$. In contrast, when $p^d_T < p^s_T$, the sector will not be viable because its normal costs of production exceed its demand price.\(^{15}\)

We can now derive for each commodity $T$, a function that gives, for each level of $e$, the maximum affordable profit rate by each tradable sector under given technical conditions and international prices. This is obtained by equalizing supply and demand prices for each commodity $T$. Hence, from conditions (2) and (4), one obtains:

$$r_T(e) = \frac{1}{(l_T + k_T e)} - 1 \quad (T = C, I) \quad (9)$$

Where for convenience, we have normalized the given international prices to one. Figure 1\(^{16}\) represents a possible shape of these curves:

As can be immediately seen from the figure, the $e - r$ curves cut the vertical axis at $r = -1$, and are positively sloped. Moreover, given the input–output relations assumed by NS for the tradable sector, it can be shown that the curves intersect only once, at the value of $e$ given by:

$$\hat{e} = \frac{l_I - l_C}{(k_C - k_I)} \quad (10)$$

Economically meaningful values of (10) require that the following condition is fulfilled:

$$(l_I - l_C)(k_C - k_I) > 0 \quad (11)$$

whose interpretation will be given in the next paragraph.

These curves can be used to determine the pattern of specialization of the peripheral economy as a problem of technical choices. In effect, due to the action of competition among capitals, the tradable sector of the economy will specialize in the production of that commodity which, for the given value of $e$, can afford the highest profit rate. If we assume, without loss of generality, that sector $I$ operates with higher “capital intensity”, that is, if $\frac{l_I}{k_I} > \frac{l_C}{k_C}$, then, for any level $e < \hat{e}$ there will be full specialization in the production of commodity $I$.\(^{17}\) In effect, if for instance: $e = \bar{e} (< \hat{e})$, then $r_I(\bar{e}) > r_C(\bar{e})$ and there will be no incentive to invest in sector $C$. The opposite occurs when $e > \hat{e}$. An only by a fluke $e = \hat{e}$, which is the level that allows the coexistence of the two tradable sectors in the economy.

It is now easy to interpret the necessary condition (11) for the existence of an intersection of the curves: for income distribution to eventually cause a shift in the pattern of specialization, it is necessary that the tradable sector with the highest coefficient of labour per unit of output is not also the one with the highest capital output coefficient.

\(^{15}\)As rightly pointed out by an anonymous referee, there are of course other non-price factors that may allow a country to export specific commodities (e.g., product differentiation, etc.). The implications of this point are beyond the scope of this paper, since this issue is not considered by the models under examination.

\(^{16}\)The technical coefficients of production that support the shape of these curves are: $l_C = 3/8, k_C = 1/8, l_I = 1/4, k_I = 1/4$. Additionally, $\bar{e} = \hat{e} = 1, \bar{e} = 1/2, r_C(\bar{e}) = 1/7$ and $r_I(\bar{e}) = 1/3$.

\(^{17}\)If one assumes that the second factor in (11) is positive, then $k_I > k_C$. And, since the first factor must be also positive for $\hat{e}$ to be positive, one obtains the factor intensity condition documented in the main text. The opposite sectorial order would arise if both factors in (11) were negative.
The outer envelope of the curve (thick black line) illustrates the economically relevant pairs of $e$ and $r$.\(^{18}\) In analytical terms, the $e-r$ relationship is given by:

$$r = \begin{cases} r_I(e) & \text{if } e \leq \hat{e} \\ r_C(e) & \text{if } e > \hat{e} \end{cases}$$

(12)

As previously mentioned, the models under consideration do not discuss the dependence of the pattern of specialization on income distribution. Instead, they directly assume that the modern sector $I$ profitably competes in the international markets at the given prices (in other words, the tradable good is always produced by sector $I$),\(^{19}\) while if consumed, commodity $C$ is imported from abroad.\(^{20}\)

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\(^{18}\)Note that, with more than two commodities, in general there will be no value of $e$ that will allow the coexistence of all tradable sectors, unless one admits heterogenous remunerations within social classes (see Baldone, 2001; Steedman, 1999, p. 272), or the existence of differential rent (see Section 4.2 below).

\(^{19}\)The equality between supply and demand prices of commodity $I$ is ensured in Rapetti’s model by Equation (3).

\(^{20}\)Therefore, the small peripheral economy exports commodity $I$ in exchange for imports of the capital good, $K$ and, if consumed, of the primary commodity $C$. No particular result of the current account is assumed by NS (see e.g., Neto & Lima, 2017, pp. 4, 7). If there is a current account surplus, the implicit assumption is that the country accumulates foreign assets. While in case of current account deficits, since the economy is also small in financial terms, it is argued that it can finance this imbalance through capital inflows (Neto & Lima, 2017, p. 4). Hence, this kind of models does not deal with the potential problems caused by the external constraint to growth usually faced by peripheral economies, and therefore, the issue, although extremely relevant for any growth strategy, will not be discussed in the present contribution. We thank the comment by an anonymous referee that allowed us to clarify this point.
In the light of our model, the implied pattern of specialization is such that \( e = \bar{e} (< \bar{e}) \) in Figure 1, and hence, the model is closed by considering the first branch of Equation (12), namely:

\[
 r = r_I (\bar{e})
\]

(13)

In sum, the eight Equation (1)–(2), (3)–(4), (7)–(13) determine the following unknowns:

\[
\{ e, r, p_{NT}^*, p_{I}^*, p_{C}, p_{NT}^d, p_{I}^d, p_{C}^d \}
\]

The model presents the following three features that are worth mentioning. The first two, because they differ from the standard results for a closed economy, while the third one because it may give the wrong impression that some of the neoclassical “parables” about factor intensities and their respective remunerations may generally hold.

First, notice that, not only does condition (13) determine the profit rate in the tradable sector, but it also determines, due to the action of free competition, the normal level of the profit rate for the whole economy; even when the tradable commodity is not used as an input in the production of any commodity. While the price equation of the non-tradable sector only determines the supply price of that good.\(^{21}\)

Second, note that in the model both the real wage and the profit rate are endogenously determined. This is because the existence of intrinsically non-tradable goods disentangles the money wage expressed in foreign currency (i.e., the inverse of \( e \)), which is a given variable, from the real wage. However, both variables necessarily move in the same direction.\(^{22}\) To see both features, let us define a given consumption basket for the representative worker as \( c = (c_C, c_I, c_{NT}) \). Thus, the real wage \( \omega \) can be expressed as \( \omega \equiv \frac{P}{P} \), with \( P = c_{NT}P_{NT} + E \sum_{T=C,I} c_T p_T^* \). Notice then that, even if the value of \( e \) were known, the price level \( P \), and therefore, the level of \( \omega \), would not be not known yet because \( p_{NT}^* \) is not determined (this would not happen if the three commodities were tradable goods, since in this case \( P \), and hence, the number of consumption baskets \( \omega \) affordable by the representative worker, would be univocally determined by \( e \)). But also note that, since a rise in \( e \) implies a rise in the normal profit rate, and therefore, for a given money wage, a rise in \( p_{NT}^* \), then it follows that the wage in foreign currency and the real wage still move in the same direction as \( e \) varies.\(^{23,24}\)

The third feature is the following. The so-called neoclassical parables about the relationship between factor intensities and their respective remunerations are verified in the model: as depicted in Figure 1, the curve with the highest capital/labour ratio intersects the other curve from above, namely a lower real wage (a higher \( e \)) eventually shifts the pattern of specialization towards the more

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\(^{21}\)The point has been raised by Steedman (1999, section 2; cf. also Siqueira Machado’s, 2017, unpublished dissertation). As he correctly argues, this pure consumption tradable commodity behaves “as only a basic commodity is said to do” (Steedman, 1999, p. 267). All this suggests, as Steedman himself concludes, “that in the context of analysing the small open economy, the concept of a basic commodity must be set aside or at least significantly modified”.

\(^{22}\)We will see in Section 4 that this condition may cease to hold when differential rent is considered.

\(^{23}\)We thank a comment made by an anonymous referee, which gave as the opportunity to clarify this point.

\(^{24}\)That both the real wage and the profit rate are endogenously determined variables, does not mean that class conflict is absent from the analysis. Given the money wage, distributive conflict is expressed in the level of the nominal exchange rate. And the latter, being exogenously determined by the monetary authority, ultimately reflects the relative power between capital and labour.
“labour-intensive” sector (in this case, sector $C$). However, we shall show in Section 4.1 that this is a strict consequence of the very particular conditions of production assumed by NS. Indeed, we will also show that if one slightly modifies the input–output relations and, for instance, assumes that the non-tradable commodity is employed as an input in the tradable sectors, the two $e-r$ curves could easily intersect more than once and, therefore, the conditions required for the validity of these parables would no longer hold.

Before we move to the next section, it is convenient to remark a second limitation of the canonical model presented so far (the first one being the alleged independence of the productive structure with respect to changes in income distribution): the distributive closure assumed by NS (a given $e$ and an endogenously determined $r$) will be generally incompatible with the equalization of profits rates across countries. A result, on the other hand, that one would have expected in the current era of “globalization”, under which capital can very quickly migrate from one country to another. This, however, would not be in itself cause of big surprise if it not were the case that, additionally, and due to the assumption of free financial capital mobility across countries, the tendency towards the equalization of returns on financial assets is accepted (see Rapetti, 2013, p. 11). This is indeed surprising because, due to the later tendency, one would have also expected the arbitrage between the domestic and the international profit rates to occur. After all, once capital flows from one country to another in the form of financial assets, unless purely institutional reasons are advanced (e.g., capital controls, minimum stay requirements, etc.), there does not seem to be economic reasons that may prevent financial capital from taking the form of productive capital. In other words, unless one highlights motives of purely extra-economic nature, which in any case are neglected by the canonical model, it seems arbitrary to assume the free mobility of financial capital and not that of productive capital.

Now, let us assume for the sake of argument that those institutional reasons exist and express the gross profit rate, $r$, as the sum of two components: the domestic interest rate, $i$, that due to financial capital mobility is equal to the international rate, $i^*$, and a normal “profit of enterprise”, $\sigma$, that somehow reflects the “risks and troubles” of investing in the productive sector:

$$ r = i^* + \sigma \quad (14) $$

It should be then clear that the difference among countries’ profit rates is entirely explained by the differences in their respective $\sigma$. Differences that, as we have already explained, under the conditions assumed by NS can be only plausibly justified by reasons that are independent of the market, and hence susceptible of being known before relative prices are determined. But if this were effectively the case, and hence $\sigma$ were given for the price system, there would be two equations to determine $r$—(13) and (14)—and the system would be evidently overdetermined.

The formal consistency of the distributive closure assumed by NS requires, therefore, two highly restrictive assumptions, which are never explicitly stated by their proponents: (a) to arbitrarily assume that the differences in the normal profits rates across countries are explained, contrarily to what we have just argued, entirely by economic forces; (b) that these differences rise with $e$, namely that there is a positive and systematic relationship between the normal profit of enterprise and the real exchange rate. This relationship could be formalized as:

$$ \sigma = \sigma (e), \text{ with } \sigma'_e > 0 \quad (15) $$
3 | TRANSMISSION CHANNELS FROM THE EXCHANGE RATE TO ECONOMIC GROWTH

In this section, we discuss the scopes and limits of the transmission channels from the exchange rate to output growth adduced by NS in their own terms, namely, under the assumption that sector $T$ is the industrial sector (i.e., $e < \hat{e}$). While some further limitations of these channels under a different pattern of specialization will be addressed in Section 4.

3.1 | Short-term mechanisms

Let us begin with those mechanisms that are assumed to operate in what NS calls the “short run”, namely under a given level of money wages and a given rate of capital accumulation. According to NS, the rise in $e$ exerts an expansionary effect through three different mechanisms, all induced by the subsequent fall in the real wage in terms of the tradable good, $\omega_T = w/p_{dI}$. The first effect is to induce producers in sector $I$ to adopt more “labour intensive” methods of production, and therefore, to raise labour demand ($L_I$) (this is denominated by this literature as “labour intensity channel”, see Frenkel & Ros, 2006). Moreover, since $\omega_T$ is now lower than the marginal product of labour, profit-maximizing firms will be induced to expand industrial output $y_I$:

$$\uparrow e \rightarrow \uparrow p_{dI}^I \rightarrow \downarrow \omega_T \rightarrow \uparrow L_I \rightarrow \uparrow y_I$$

(A1)

These expansionary effects also cause a rise in the production of good $NT$. Firstly, because the expansion of $y_I$ increases aggregate income and, therefore, the demand for $NT$ ($D_{NT}$) (this is called “income effect” by Rapetti, 2013, p. 7).

$$\uparrow y_I \rightarrow \uparrow D_{NT} \rightarrow \uparrow L_{NT} \rightarrow \uparrow y_{NT}$$

(A2)

Second, because the rise in the relative price $p_{dI}^I = p_{dT}/p_{dI}$ increases the demand for—the now relatively cheaper—good $NT$ (called “substitution effect” by Rapetti, 2013, p. 7).

$$\uparrow e \rightarrow \uparrow D_{NT} \rightarrow \uparrow L_{NT} \rightarrow \uparrow y_{NT}$$

(A3)

25 Of course, the labour intensity channel assumes that there are several methods of production to produce commodity $I$. While this aspect of the productive structure has been neglected in the presentation of the canonical model in Section 2, we will see below that the model can be easily reinterpreted to account for the existence of several methods of production in sector $T$. In this respect, it is worth pointing out that the technology presented by NS for the tradable sector not only does assume decreasing marginal returns to both capital and labour (this is formalized by assuming a Cobb–Douglas production function that uses labour and capital as inputs, but this is immaterial for our analysis), but also increasing returns to scale. Moreover, to be compatible with free competition, the returns to scale are assumed to be external to the firm and internal to the industry. This is allegedly due to “externalities in the learning process” (Rapetti, 2013, p. 12). Note that these conditions are highly restrictive since “…the economies of production on a large scale can seldom be allocated exactly to any one industry: they are in great measure attached to groups, often large groups, of correlated industries” (Marshall, cited by Sraffa, 1926, p. 540). It seems therefore arbitrary to assume that the externalities that affect sector $T$ do not have any influence on sector $NT$ as well. The assumption is tantamount to assuming the technical disconnection among productive sectors, ignoring the possible input–output relations that generally emerge among them, and would immediately cease to hold if, for instance, one slightly modifies the canonical model and considers the possibility that commodity $T$ were used as input of commodity $NT$. 

Electronic copy available at: https://ssrn.com/abstract=3613983
To ascertain the validity of these three mechanisms, it is necessary to make two observations: first, that the negative relationship between labour demand and $e$ is a necessary yet not a sufficient condition to justify the initial increase in $L_I$. Without any additional consideration, and under the plausible assumption that workers’ propensity to consume is higher than capitalists’ propensity (see, for instance, Rapetti, 2013, p. 14), one should expect that the incentive to expand the production of commodity $I$ will be sooner or later counterbalanced by a fall in $D_I$ that, ceteris paribus, is caused by the fall in the real wage (recall that $e$ and $\omega$ move in the opposite direction). Hence, to ascertain that the rise in $e$ will anyway exert a favourable effect on employment, it is further necessary to justify how the excess of production of $I$ over internal consumption will be absorbed. For instance, the marginal approach argues that the higher level of savings caused by the increased levels of output are eventually absorbed by higher levels of investment through movements in the interest rate. But NS does not envisage this mechanism, at least explicitly.26 And while it recognizes the possible recessive effects of the fall in the real wage,27 the issue is virtually neglected because every excess of production over internal consumption is assumed to be passively absorbed by the demand for exports ($X_I$). Hence:

$$X_I = y_I - D_I$$

Therefore, this adjustment presumes the absence of effective demand problems. Now, behind the idea that the demand for exports is infinitely elastic at current prices we find NS arguing the only apparently equivalent notion that the economy is sufficiently “small”, that is, an economy that takes the selling price of commodity $I$ as given. Note however that for this last condition to hold, it is only necessary that neither the domestic method of production nor domestic income distribution are relevant magnitudes to determine the international price of this commodity; and hence, it does not need assume that the share of exports in the global market is of any particular magnitude (as long as this proportion is smaller than 1).28

The second consideration refers to the bases that justify the negative (and sufficiently elastic) relationship between employment and the level of the real wage itself. As seen above, here NS does closely follow the marginal approach and argues that the fall in $\omega_T$ increases employment because productive processes that employ more labour per unit of output become more profitable.

The fact is, however, that the labour intensity channel works in the direction adduced by NS only because all the produced means of production are imported at given international prices.29 To see this more clearly, we must reconsider our model in the following way: instead of assuming that there is one single method to produce each tradable commodity, let us assume that $I$ and $C$ are now two different methods to produce the specific tradable good $T$.30 Because international prices are given, it makes no

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26 For reasons of space, it is not possible to deal with this issue here, but labour-capital substitution, accepted by NS, implies the existence of a negative relationship between aggregate investment and the interest rate (see Dvoskin & Petri, 2017).

27 See Frenkel and Ros (2006, p. 635), Razmi (2007) and Rapetti (2013, p. 6, fn. 9).

28 To link the assumption of given prices with particular conditions of demand, it is further necessary to establish general price–quantity relations that univocally determine the way in which demand influences technical conditions of production and/or distribution (see Garegnani, 1983). But these relations do not seem to exist outside the very restrictive world of “well-behaved”, neoclassical factor demand curves.

29 On this point see also Steedman (1999, p. 262).

30 This reinterpretation of the model is not actually necessary, since as Frenkel and Ros (2006, p. 635) argue, the labour intensity channel takes place, either through “the adoption of more labour intensive techniques”, as explained in the main text, or through “the reallocation of labour and investment towards labour intensive tradables”, which is our formalization in Section 2 can capture.
difference whether we assume that each method uses a specific imported capital good, or not. If we normalize foreign prices to one, the relative cost of production of the two methods is:

$$\frac{p^S_C}{p^S_I} = \frac{(1+r) \left( l_C w + Ek_C \right)}{(1+r) \left( l_I w + Ek_I \right)} = \frac{l_C + ek_C}{l_I + ek_I}$$

(17)

It is evident that a sufficient increase in $e$ decreases the cost of production of the method with a lower capital/labour ratio and, therefore, profit maximizing firms will adopt it. If without loss of generality, we assume that $\frac{k_C}{l_C} < \frac{k_I}{l_I}$, then\(^{31}\):

$$\frac{d}{de} \left( \frac{p^S_C}{p^S_I} \right) < 0$$

(18)

The reason is evidently that, although there is production of capital goods, since their prices are given for the domestic economy, changes in income distribution do not affect, by assumption, capital good prices and, therefore, the “paradoxes” highlighted during the so-called “Capital Debates” of the 1960s and 1970s cannot occur.

As seen in the previous section, in terms of Figure 2 all this means that the curve that represents the conditions of production of the method with the highest capital/labour ratio (i.e., the highest $k_T/l_T$) is employed for lower levels of $e$ and eventually cuts the less capitalistic method from above. However, the moment one slightly departs from the particular conditions of production assumed in the canonical model, and considers instead the possibility that, for instance, the non-tradable good is used as an input in the production of the tradable commodity (a possibility that is even accepted by some authors of the approach, see e.g., Ros, 2016, p. 234), changes in income distribution will affect capital goods prices and therefore, the labour intensity channel may not work in the direction predicted by NS.

To see this, consider the case that, besides labour and the imported capital good, each method of production employs a quantity $b_T (T = C, I)$ per unit of output of commodity $NT$. Now the relative price of commodity $T$ under both methods, $\frac{p^S_T}{p^S_{C, I}}$, is\(^{32}\):

$$\frac{p^S_C}{p^S_I} = \frac{[l_C + b_C l_{NT} (1+r)] e + k_C}{[l_I + b_I l_{NT} (1+r)] e + k_I}$$

(19)

Condition (19) shows that the relative price is now a function of the profit rate $r$, and this will generally mean that $\frac{p^S_C}{p^S_I}$ may move in any direction when $e$ varies.

$$\frac{\partial}{\partial e} \left( \frac{p^S_C}{p^S_I} \right) \geq 0$$

(20)

\(^{31}\)Since $\frac{d}{de} \left( \frac{p^S_C}{p^S_I} \right) = \frac{k_C (l_I + ek_I) - k_I (l_C + ek_C)}{(l_C + ek_C)^2}$, the sign of this derivative is determined by the sign of the numerator, which can be re-expressed as: $l_I k_C - l_C k_I$. Hence, $\frac{d}{de} \left( \frac{p^S_C}{p^S_I} \right) < 0 \Leftrightarrow \frac{k_C}{l_C} < \frac{k_I}{l_I}$

\(^{32}\)The supply price of the tradable good under method $T = C, I$ is $p^S_T = (l_T w + Ek_T + b_T l_{NT}) (1+r)$. If we replace $p_{NT}$ by Equation (1), we obtain $p^S_T = (l_T w + Ek_T) (1+r) + b_T w l_{NT} (1+r)^2$. Finally, dividing both supply prices yields (19).
Graphically, we could easily observe that the two $e - r$ curves intersect more than once, namely that the convenience of a particular method does not show any relation whatsoever with $e$: the same method could be adopted for low ($e < \hat{e}_1$) and then high ($e > \hat{e}_2$) values of the wage in foreign currency, showing a sort of “reswitching” in methods. This is shown in Figure 2.

Besides the difficulty addressed in the main text, it is worth mentioning a second difficulty with the labour intensity channel when it is used within NS: it is unclear what is assumed to be given with respect to the factor “capital” when the marginal product of labour in sector $T$ is determined. The neoclassical mechanisms of substitution duly consider that capital goods are specific to each technique, and hence plausibly presume that the “form” of the cooperating capital generally changes with the change in the cost minimizing method. To proceed in this way, neoclassical theory is forced to assume a given “quantity” of capital, measured in value terms. A magnitude that, therefore, does not change when income distribution changes, something that is well known to be unacceptable. On the contrary, NS seems to take as given the physical stock of capital goods existing at any given moment. But if the available capital goods before and after devaluation are the same, it may well happen that the labour demand curve is highly inelastic, with the implication that a drastic—socially unbearable—fall in the real wage is needed to achieve a certain target level of employment. The problem is somehow hidden in the new-structuralist versions of the canonical model because the conditions of production assumed presuppose that the same kind of capital good is used in different proportions when the quantity of labour employed changes. But it would become immediately evident once a more general specification of the available techniques is considered (for a detailed analysis of this problem, see Dvoskin & Fratini, 2016). It could be finally argued that the higher level of employment can be accommodated without any change in form of the existing capital stock because, in the short run, there is idle capacity. The problem here is that the marginal product of labour should be constant, and therefore, the positive relationship between $L_T$ and $e$, would be lost. If before devaluation the marginal product of labour in the tradable sector equals $w/p_T$, one would have to accept that the rise in $e$ would indefinitely expand output and employment in sector $I$, at least until full capacity is reached. Anyway, once full capacity is restored, for the above-mentioned reasons, the marginal product of labour would still be zero (or very close to zero). Finally, as long as there is idle capacity, NS would also have to accept that the marginal product of capital would be zero, contradicting the assumptions of the canonical model.

The technical coefficients of production that support the shapes of these curves are: $l_I = 1/15; b_I = 7/30; k_I = 1/20; l_C = 7/60; b_C = 17/60; k_C = 1/10; l_{NT} = 1$. Additionally, $\hat{e}_1 = e_1 = 50\%$ and $\hat{e}_2 = e_2 = 100\%$. 

FIGURE 2  Reswitching of techniques in the tradable sector
3.2 | Medium- and long-term mechanisms

The medium-term mechanism supposes, for a given level of capital accumulation, a change in the composition of output in favour of the modern sector $T$, while the longer-term channel presumes an increase in the rate of capital accumulation due to the rise in the general rate of profits.

Let us consider first the medium-term mechanism. Devaluation raises the demand price of the tradable good ($p^d_I$); and since the demand price of the non-tradable good ($p^d_{NT}$) does not initially change, the relative price, $\frac{p^d_I}{p^d_{NT}}$, rises too. Therefore, the actual profit rate of sector $T$ ($r_I$) temporarily increases relative to that of sector $NT$ ($r_{NT}$). This change in relative profitability triggers a virtuous process of “structural change” (Rapetti, 2016, p. 259) by inducing the reallocation of resources to the relatively more productive and dynamic tradable industry, until $p_{NT}$ rises sufficiently to restore the equalization of returns across sectors at a higher level.

If we now turn our attention to the longer-run mechanism, NS postulates that capital accumulation is an increasing function of net profitability. And given that the rise in $e$ has caused an increase in $r$, then the rate of capital accumulation, $g_K$, rises:

$$\uparrow e \rightarrow \uparrow \frac{p^d_I}{p^d_{NT}} \rightarrow \uparrow r_I \rightarrow \uparrow \frac{y_I}{y_{NT}} \rightarrow \uparrow r_{NT}$$  \hspace{1cm} (B)

This mechanism is known in the literature as the “development channel” (Frenkel & Ros, 2006, pp. 636, 637).\(^{35}\)

The difficulty with mechanism (B) is the following. As this channel rightly documents, since in the model the tradable sector determines the profit rate of the whole system, the price of the non-tradable good will rise to accommodate a higher profit rate of industry $NT$: otherwise, production of this commodity will not be convenient. However, under the specific conditions addressed by NS, the rise in $p_{NT}$ is not expected to be the outcome of the change in the composition of output in favour of sector $T$. To see this, it is enough to consider that sectorial effectual demands will not necessarily change in the direction predicted by the approach. If any, internal demand for good $T$ will decrease, since its demand price has risen relative to the money wage, while, on the other hand, there is no reason to expect an increase in foreign demand, since its international price has not changed. Therefore, unless once again one resorts to the arbitrary assumption of an infinitely elastic demand for exports,\(^{36}\) there is no reason to expect that the temporarily higher profitability in sector $T$ will permanently increase its share in total output.\(^{37}\)

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35 Rapetti’s “tradable-led growth” channel (Rapetti, 2016, p. 259) includes both the effects on the composition (B) and the level (C) of investment.

36 It could be also assumed that the demand for $T$ comes from capitalists’ consumption, whose income has increased due to devaluation. This assumption, however, would not be less arbitrary. And one should not overlook that, while the real income of sector $T$-capitalists has risen, that of sector $NT$-capitalists has been reduced by depreciation. Thus, one must further assume that $T$-capitalists’ propensity to consume is higher than $NT$-capitalists’ propensity.

37 Of course, at the level of the theory of normal prices, it is not possible to exclude the possibility of a temporary rise in the production of $T$ due to its higher profitability. All that can be determined by the theory are the fully adjusted positions before and after devaluation. On this point, see Parrinello (1990) and more recently, Fratini and Naccarato (2016).
It could be finally argued that foreign demand for commodity $T$ rises because devaluation has permanently diminished domestic costs in foreign currency, and therefore the domestic economy gains markets at the expense of its foreign competitors. This claim would be however overlooking that, under the assumptions of the canonical model, this difference between costs of production and international prices cannot but be transitory (and in fact will be eliminated due to the rise in profitability caused by devaluation); otherwise, one would be forced to admit that domestic production conditions would eventually regulate the international price of the tradable good, hence contradicting the assumption of a small price-taking country that is at the core of the canonical model.

The main difficulty with channel (C) is that it needs devaluation to be able to persistently alter income distribution in favour of profits. However, even new-structuralist scholars document two possible reasons why this need not be the case, both due to wage resistance. First, since NS generally assumes that the non-tradable sector exhibits decreasing returns to scale (see e.g., Rapetti, 2013, p. 11 and Equation (6) of p. 12), devaluation, through a higher non-tradable output, raises $p_{NT}$. Therefore, workers may attempt to re-establish their initial real wage, which, due to the assumption of homogeneous wages across sectors, ultimately erodes profitability in the tradable sector:

$$
\uparrow y_{NT} \rightarrow \uparrow p_{NT} \rightarrow \uparrow w \rightarrow \downarrow r \quad \text{(WR1)}
$$

Second, due to the expansionary effect of devaluation in both sectors, unemployment ($U$) decreases and workers’ stronger bargaining power should allow them to claim for higher nominal wages:

$$
\uparrow y_T \land \uparrow y_{NT} \rightarrow \downarrow U \rightarrow \uparrow w \rightarrow \downarrow r \quad \text{(WR2)}
$$

While, under the assumption that output increases due to devaluation, channel (WR2) is plausible enough as it stands, the action of (WR1) demands some qualification. As it is presented by NS, the argument does not seem sufficiently robust, since it needs the arbitrary assumption that sector $NT$, typically services, operates under decreasing returns to scale. However, if one accepts the plausible claim that the potential increase in $p_{NT}$ may trigger wage resistance, the risks that the latter may annul the initial rise in profitability are more severe than what NS seems to acknowledge. The reason is the following: the moment one recalls that the normal profit rate of the economy is determined by sector $T$, the rise in $p_{NT}$ will be the necessary consequence of the tendency to equalization of profits rates. And, as we have argued above, for this to happen there is no need for an increase neither in the composition nor in the scale of output. Since no changes in the quantities produced by $NT$ are actually needed for $p_{NT}$ to rise, wage resistance can indeed exert its effects much faster than what is believed by the proponents of the approach and therefore, the alleged virtuous process of growth may even vanish before gaining momentum.\footnote{A further weakness of channel (C) is related to the assumption that aggregate investment positively depends on normal profitability. This is however hard to justify, since it assumes that the trajectory of expansion of output capacity is independent of the behavior of final demand for consumption goods. For reasons of space, but also because it escapes the aims of the present paper, we cannot deal with the issue in detail here (see, among others, Freitas & Serrano, 2015; Pariboni, 2016).}

Hence, when both WR channels are duly considered, it seems safe to conclude that, over sufficient time, two counterbalancing forces operate on accumulation: on the one hand, the initial rise in the profit rate fosters capital accumulation. On the other hand, the faster growth of nominal wages tends to erode normal profitability. Thus, the final effect on the rate of accumulation is indeterminate, a difficulty that is even accepted by some new-structuralist authors (see, for instance, Rapetti, 2013, p. 21).
As we have anticipated in the introduction, there is a fourth expansionary mechanism, also of “structural change”, that works both in the medium and long runs. It is based on the possibility of diversifying the productive structure by incorporating new tradable sectors that, before devaluation, were not internationally competitive. “A more depreciated RER [real exchange rate]”, Frenkel and Ros (2006, p. 635) argue, “encourages tradable activities that were not profitable before”. If we consider for instance sector $C$, whose supply price, under the productive structure assumed by NS, is higher than its demand price, then devaluation raises the latter in a greater proportion than the former, and thereby its profitability, until both prices are equal. And this allows domestic production of $C$ to start. Schematically,

$$\uparrow e \rightarrow \uparrow p_C^d \rightarrow p_C^d = p_C^s \rightarrow y_C > 0$$

(D)

Unlike the previous three channels, this mechanism does admit an influence of income distribution in the productive structure. The problem, however, is that it does not seem very easy to accommodate within the canonical model. Not only because the latter assumes a given pattern of trade (this indeed may explain why this mechanism is simply stated, but never developed in detail). More problematic, in any case, is that this mechanism implicitly supposes that the diversification of the structure is not damaging for the existing sectors of the economy. But this forgets that devaluation, through its effect on $r$, also changes relative costs of production, and therefore the relative convenience of investing in a specific sector. We have seen in fact that, flukes apart, that is, in the intersection of the $e-r$ curves, the international competitiveness of one sector can only be achieved at the expense of the other. Anyway, we will return to channel (D) in the following section, when we see that, under conditions of differential rent, it is indeed possible to diversify the productive structure in the sense adduced by NS.

4 | THE WORKING OF THE GROWTH CHANNELS IN LATIN AMERICAN PRODUCTIVE STRUCTURES

4.1 | The $e-r$ relationship under differential rent

Let us now examine additional problems with the channels discussed in the previous section, once we consider a pattern of specialization more suitable for Latin American countries. We will focus on the $e-r$ relation of the previous sections, central to trigger the action of the expansionary mechanisms of devaluation. Consider, then, a productive structure such that $T$ produces and exports a primary consumption good (the tradable sector is sector $C$). The industry, on the other hand, cannot compete abroad at given international prices.39

Before we proceed to formalize the new conditions of production of the tradable sector, it is necessary to make the following observation. Differently from the analytical framework of Section 2, it is assumed that, due to the existence of a fixed factor in the production of $C$, typically land, the potential extra profits accrued by producers operating in the sector when $p_C^d > p_C^s$ are not eliminated through a rise in the profit rate; rather, they are eventually appropriated by landowners in the form of differential rent, $\rho$.40

39 For a similar characterization of productive structures of developing countries, see Botta (2010).
40 Note that differential rent can emerge even if there is no marginal land within the domestic economy. On this point see Birolo (1981).
\[ \rho = E p_{c}^{*} - p_{c}^{S} > 0 \]  

(22)

This presents, in turn, the following difficulty. In the canonical model of Section 2, for a given \( e \), the profit rate was univocally determined by the equality between supply and demand prices of the tradable commodity (given the money wage, the real wage was also endogenously determined once \( p_{NT} \) and \( p_{d}^{T} \) were known). When the equality between supply and demand prices no longer holds, a given \( e \) is not enough to determine \( r \), and therefore, the system gains an additional degree of freedom. Formally, price Equations (1)–(2C) and (22) have the following unknowns: \( e, r, \rho, p_{c}^{*}, p_{NT} \) (implicit in (22) there is Equation (3C), i.e., \( p_{d}^{T} = E p_{c}^{*} \)). Therefore, besides \( e \), it is necessary to fix from outside the price system either (a) the profit rate, or (b) the real wage. In turn, alternative (a) allows for at least two different possibilities: (a1) for a given normal profit of enterprise, we can assume that \( r \) follows the pace of the money interest rate fixed by the Central Bank (see Panico, 1988; Pivetti, 1991); or (a2) there is some mechanism that, for a given interest rate, endogenously determines \( r \) as a function of \( e \) (for instance, the mechanism that, as we have seen at the end of Section 2, is envisaged by NS see Equation (14)). On the other hand, closure (b) can be formalized, for instance, by fixing the price of the wage basket of the average worker as the numéraire.

It is convenient to examine each of the three possible cases in detail. Alternative (a1) formally supposes that:

\[ r = \bar{r} \]  

(23A)

Here, given \( r \) by (23A) and \( e \), Equation (1) determines \( p_{NT} \) and Equation (2) determines \( p_{c}^{S} \). The magnitude of the rent is determined by (22).

Alternative (a2) can be formalized as:

\[ r = g(e), r'(.) > 0 \]  

(23B)

Thus, a given \( e \) determines \( r \) through (23B), and hence, it is possible to determine, through conditions (1) and (2), respectively, \( p_{NT} \) and \( p_{c}^{S} \), while the magnitude of the rent is again determined by (22).

Finally, when \( c = (c_{NT}, c_{c}, c_{I}) \) represents the unitary wage basket, closure (b) can be formalized by:

\[ P \equiv c_{NT} p_{NT} + E \sum_{T \in C, I} c_{T} p_{T}^{*} = 1 \]  

(23C)

And therefore, a given \( \bar{w} \) determines the quantity of baskets affordable by each worker. In turn, given \( e \), Equation (23C) determines \( p_{NT} \), while now condition (1) has the role to determine the profit rate. Equations (2) and (22) again determine \( p_{c}^{S} \) and \( \rho \). It should be noticed that, with this closure of the price system, a rise in \( e \) decreases \( p_{NT} \). And hence, the consistency of the system further requires, for a given money wage, a decrease in \( r \). All this means that \( r = f(e) \), with \( f'(e) < 0 \).

Figure 3 shows the interaction among distributive variables in the presence of differential rent in sector \( C \), and hence, when there is an additional degree of freedom left (the fact that the feasible
distributive configurations are now illustrated by the grey area in the figure rather than by a curve, shows this additional degree of freedom). The following features can be seen from the figure. For a given $e = \bar{e}$: (i) $\bar{e} > \hat{e}$, since $C$ is assumed to be the most profitable tradable sector; (ii) there is a range of possible values for the effective profit rate, $\bar{r}$, that are compatible with the assumed productive structure. This rate is necessarily below $r_C(\bar{e})$ and above $r_I(e)$. This means that, while sector $C$ is persistently “ supra-competitive”, and hence yields a rent, commodity $I$ will not be profitability produced.\footnote{Actually, $\bar{r}$ can also be over $r_I(e)$. In this case, sector $I$ earns the normal profit rate, and therefore, can coexist with the rentistic sector $C$ (see Section 4.2 below). On the contrary, if this rate was below $r_I(e)$, the distributive configuration would not persist, since it would imply that sector $I$ would be earning a higher profit rate than sector $C$, and therefore, its supply price would necessarily rise.}

In Figure 3,\footnote{The technical coefficients of production that support the shapes of these curves are the same as those of Figure 1, with $\bar{e} = \bar{r} = 2, r_C(\bar{e}) = 11/5$ and $e_C = 9/5$.} the rent can be observed, so to speak, in two different ways: (i) given $\bar{e}$, through the difference between the effective profit rate, $\bar{r}$, and the maximum profit rate, $r_C(\bar{e})$, that industry $C$ could afford; (ii) for a given $\bar{r}$, as the difference between $e$, and the highest level ($e_C$) that the sector could support.

The possibility of differential rent in sector $C$ has important consequences for the transmission channels adduced by NS. With the additional degree of freedom, the necessary connection between the money wage in foreign currency and the profit rate shown in Section 2, is lost. The implication is that the effect of a rise in $e$ over $r$ becomes indeterminate: if, jointly with $e$, the profit rate is determined by condition (23A), it is expected that the profit rate will not change with devaluation. And it can even decrease if the real wage is exogenously given through condition (23C). To be clear, we are
not excluding that devaluation may positively affect the profit rate; this is in fact what happens under the closure formalized through condition (23B). The important thing, however, is that differently from the canonical model of Section 2, when the tradable sector works under conditions of differential rent, this positive relationship loses the necessary character that is needed by NS to establish a sufficiently general causal relationship between the real exchange rate and economic growth.

To sum up, then, it is expected that when \( e \) rises, the level of the rent rises too, while the profit rate can either rise, fall or remain constant. A first implication is that, even if the transmission channels work in the “right direction”, devaluation will not generally be able to trigger their action. Some further implications will be addressed in the following section.

### 4.2 A reexamination of structural change channel (D)

We have seen at the end of Section 3 that NS envisages a fourth mechanism, of structural change (channel (D)), which however does not easily fit within their canonical model, since we have shown that it is not possible to incorporate a tradable sector without negatively affecting the normal profitability of the existing one. However, the coexistence of tradable sectors is possible when one of them works under conditions of differential rent and therefore, this channel may work in the direction advanced by NS.

Let us see this in further detail. If, for a given \( e \), sector \( C \) yields the profit rate \( \bar{r} \), it is possible to determine the minimum level of \( e \) that would allow the other tradable sector (in this case, industry \( I \)) to yield this same level of the profit rate. This level, \( e_I \), is no other than the level that equalizes supply and demand prices for this sector, and is determined by the following condition:

\[
e_I = \frac{(1 + \bar{r}) l_I}{1 - (1 + \bar{r}) k_I}
\]

Note that at the level \( e_I \) both sectors would earn the same profit rate, \( \bar{r} \), and therefore could coexist (besides the normal profit rate, sector \( C \) would also earn a differential rent). But then, this would further seem to suggest that, for sector \( I \) to be internationally competitive, a devaluation of magnitude \( \Delta e_I \) is needed, with:

\[
\Delta e_I = e_I - \bar{e}
\]

Equation (25) provides a sort of sectorial index of competitiveness. In graphical terms (Figure 4).44

The problem here emerges when one attempts to calculate, for practical purposes, the required magnitude of devaluation for a generic tradable industrial sector \( T \), since this needs very carefully considering both the direction and magnitude of the possible interactions among distributive variables. In fact, the attentive reader may have already noticed that the magnitude of \( \Delta e_I \) in (25) is a function of the normal profit rate, whose behaviour, as we have seen in Section 4.1, must be ascertained case by case. Therefore, at least the following three scenarios are conceivable:

**Scenario 1:** consider first the case in which the profit rate is an increasing function of \( e \), \( g(e) \), as in Equation (23B). The initial distributive configuration is represented by point A in Figure 5. In this

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44 The technical coefficients of production that support these shapes of the curves are the same ones than those used in Figure 1 with \( \bar{r} = \bar{e} = 2 \) and \( e_I = 3 \).
FIGURE 4  “Required” devaluation of sector 1

FIGURE 5  Depreciation and pattern of specialization under scenario 1
case, Equation (25) underestimates the magnitude of devaluation to include sector \( I \) in the productive structure, since it does not consider the endogenous movement of \( e \) when \( e \) varies. In the figure, the \( e \) —coordinate of point \( B \), \( e_I \), represents the required exchange rate according to (25), while the corresponding of point \( C \), \( e^* \), indicates the higher level of the exchange rate effectively needed, once the change in normal profitability according to \( g(e) \)—whose possible trajectory is depicted by the dotted black arrow—is considered.

As a result, Figure 5 shows two possible outcomes. If the effective exchange rate is initially raised up to \( e_r \), either devaluation stops there and the final distributive configuration is reflected by \( D \) (which, differently from \( B \), does capture the effective interaction between \( r \) and \( e \)). This only causes a decrease in the money wage in foreign currency—and in the real wage—and a rise in \( r \) (and eventually in \( \rho \)), but it is unable to modify the prevailing productive structure. Alternatively, the policymaker, who is decided to transform the productive structure, attempts to further devalue the currency to complete the effective path of \( g(e) \), described by trajectory \( DC \). However, in this latter case, since the effective magnitude of the required devaluation may be considerably higher than the one originally projected, the possibility that the decrease in the real wage is so drastic that workers are prevented from consuming the minimum quantity of necessary consumption goods, cannot be excluded. As necessary goods, however, they will inevitably exert an influence on income distribution, borrowing an expression from Sraffa (1960, p. 10), “in devious ways (e.g., by setting a limit below which wages cannot fall).” And this could be exerted, for instance, through wage resistance. To have an idea of this possibility, assume \( a \) measures the minimum quantity of the necessary consumption good, \( C \). In this case, this threshold, \( e_a \), is simply equal to \( \frac{1}{a} \).

Scenario 2: policymakers could be tempted, when there is more than one possible industrial sector in the economy, to encourage the generic industry \( M \) in Figure 6, either because it is considered “strategic” for the economy; or simply because, on the basis of (25), it is the sector that exhibits “comparative advantages”; namely the sector that is believed to require the lowest fall in the wage expressed in foreign currency to be profitably produced, and which is therefore seen as the least costly in distributive terms. To this end, \( e \) is raised from its initial level, \( \bar{e} \), up to \( e_M \). However, if the effective distributive interactions are instead reflected by conditions (23C)—and by the corresponding function \( r = f(e) \) (with \( f'(e) < 0 \))-it is conceivable that the rise in \( e \) ends up promoting, since it negatively affects normal profitability, the less-desired sector \( N \). In Figure 6, \( e_M \) is shown by point \( C \), whose \( e \)—component is the inverse of the minimum level of the wage in foreign currency compatible with the given real wage, \( e_C \), that also respects the condition of zero “extra profits” of the operating industrial sectors. Below this level, in fact, one of these two conditions is necessarily violated, and therefore the attempt to further devalue the currency is bound to fail.

Scenario 3: Finally, the most problematic scenario seems to emerge in the following case. Suppose distributive conditions are such that, besides the rentistic sector \( C \), there simultaneously is another industrial sector \( N \) that is already competing abroad. However, due to its higher number of linkages with the remaining sectors of the economy, policymakers decide to develop a different industrial sector \( M \). The economy is initially at point \( A \) in Figure 7 and therefore, the policymaker uses competitiveness index (25) to determine the level of \( e \) needed for sector \( M \) to earn the ruling profit rate, \( \tilde{r} \). \( e_M \).

Therefore, he fails to capture the actual relationship between \( e \) and \( r \), reflected by the function \( g(e) \)

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45 The technical coefficients of production that support the shapes of these curves are the same as those of Figure 1, with \( A = (2;2), B = (3;2), C = (4;11/5) \) and \( D = (3;21/10) \).

46 The technical coefficients of production that support the shapes of these curves are the same as those of Figure 1, where sector \( M \) is the one previously labeled as sector \( I \). Technical coefficients of sector \( N \) are \( k_N = 19/63 \) and \( k_M = 1/8 \). Point \( C = (9/4;9/5) \) and function \( f(\cdot) \) is defined by \( (c_M, c_N) = (5/23;2/23;2/23) \). Finally, \( \tilde{r} = \bar{e} = 2 \) and \( e_p = 3 \).
FIGURE 6  Depreciation and pattern of specialization under scenario 2

FIGURE 7  Depreciation and pattern of specialization under scenario 3
in the figure. Here exchange rate policy faces two potential problems. First, this rate of devaluation fails to develop sector $M$, since at the higher level $e_M$, the actual profit rate rises to $g(e_M)$, which is unaffordable by the sector. Second, and perhaps more important, this policy also excludes the existing sector $N$ from the productive structure, since $g(e_M)$ is higher than the maximum profit rate affordable by industry $N(r_N)$. The conclusion is that devaluation policy not only does not improve, but also deteriorates national competitiveness.

## 5 | CONCLUSIONS

Motivated by mixed empirical evidence, we have critically explored the transmission channels from real exchange rate undervaluation to economic growth adduced by NS. To this end, we have slightly modified the new-structuralist canonical model, and endogenized the productive structure of the economy. Our results can be summarized as follows: a first limitation of the canonical model is that despite the assumption of free financial capital mobility, the closure of the model is incompatible with full equalization of profit rates across countries, which not only is undoubtedly restrictive but also, to avoid an overdetermination of the profit rate, requires the further assumption that differences in countries’ net profit rates are entirely explained by movements in the exchange rate.

We have subsequently shown that the transmission channels work under very restrictive assumptions. First, the short-term mechanism assumes an infinitely elastic demand for exports and takes for granted that productive methods or sectors can be ordered in terms of their capital/labour ratio independently of distribution. Second, for the medium-term mechanism to work, one is forced to assume either that there is an infinitely elastic demand for exports that validates the shift in the composition of output in the direction adduced by NS, or alternatively, to abandon the assumption of a small price-taking economy, which is at the heart of the approach. Finally, for the long-term mechanism to reach definite results, one must neglect the effects of wage resistance, which, when duly considered, are even more serious than what NS seems to acknowledge. In sum, the positive results do not resist minor modifications to the canonical model, for example, that sector $NT$ produces a capital good employed by the tradable sector, the existence of some limits to foreign demand or the possibility of wage resistance.

On the other hand, when the tradable sector works under conditions of differential rent, as it is the case in many Latin American countries, the positive relationship between the real exchange rate and the profit rate does not necessarily hold, and therefore, even if the above-mentioned problems with the expansionary mechanisms are neglected, the latter need not be activated by devaluation. Moreover, although under these conditions the exchange rate may be used as a tool to boost a particular sector of the economy, the potential risks of this policy should not be underestimated. In particular, we have shown that not only does this require identifying a priori, and with high precision, all the possible interactions—both in their direction and magnitude—among the distributive variables of the system. We have further shown that the rise of the exchange rate may even have an effect opposed to the one pursued and erode the profitability of already-competitive productive sectors.

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