

# Sectorial shifts and Inequality. How to relate macroeconomic events to inequality changes

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## Abstract

This paper presents a way to explore how macroeconomic shifts may cause inequality changes. It is based on the backwardness observed in certain sectors in developing countries. It shows why highly dualistic economies tend to be more unequal than economies with flexible and integrated labour markets. Assuming that an inter-sectorial wage gap exists, this methodology allows control over the direct impact on inequality changes caused by macroeconomic changes that affects the relative competitiveness between the tradable and non-tradable sectors. The methodology aims to find the wage gap change (in log units) taking place between two points in time, which is not dependent on the distribution of endowments and their returns of the employed population (observed and unobserved). The decomposition methodology shows to be consistent under few assumptions (log normal distribution of earnings and inter-sectorial stochastic dominance) and was tested using observed and simulated data. We suggest a channel through which trade integration can affect the wage inequality in a context of capital-skill complementarity and imperfect mobility of workers supporting the findings by Devillanova et al. (2010). Since backwardness is a source of inequality, policies oriented to encourage labour mobility appear to be highly desirable in such economies.

JEL Classification: D63, C15

Keywords: Inequality, Decomposition, Wage-gap, Tradable and Non-tradable sectors, Micro-econometric Simulations.

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# 1 Introduction

Boeke (1953) describes the simultaneous existence of both a traditional and a modern economic sector in a colonial economy. The traditional sector is labour intensive, with insufficient levels of capital stock and labour division; it takes place in rural areas mostly in the form of small-scale agricultural activities. In contrast to this, the modern sector is based on capital-intensive industries and large-scale agricultural activities oriented towards international markets. It is also argued that the large-scale agricultural modern sector mostly favours foreign enterprises without affecting rural wages and living standards.

The descriptions made by Boeke during the last century seem to also be experienced by many developing countries in Latin America. Acemoglu and Robinson (2001) argue that the Spanish and Portuguese colonization strategy consisted of establishing a complex trade system of monopolies and trade restrictions in order to maximize the extraction of resources from the colonies. Unfortunately, extractive institutions continue to exist (to use the terminology of Acemoglu and Robinson) and are reflected nowadays in many political systems in the developing world. Robinson (2010) states that political systems tend to generate inegalitarian forces if political power is concentrated amongst narrow elites. As a matter of fact, developing countries are usually dominated by non-consolidated forms of democracy, thus allowing institutions to encourage or sustain an unequal distribution of incomes.<sup>1</sup>

Cornia (2012) argues that the desired inequality reduction in South America was achieved through macro policies favouring the labour-intensive tradable sector, as well as through changes in labour market policies and institutions. However, highly dualistic economies are usually characterized by the lack of such policies supporting the tradable sector and as a result, the dual structure of the economy appears to be a sort of equilibrium based on labour vulnerability and underemployment.<sup>2</sup>

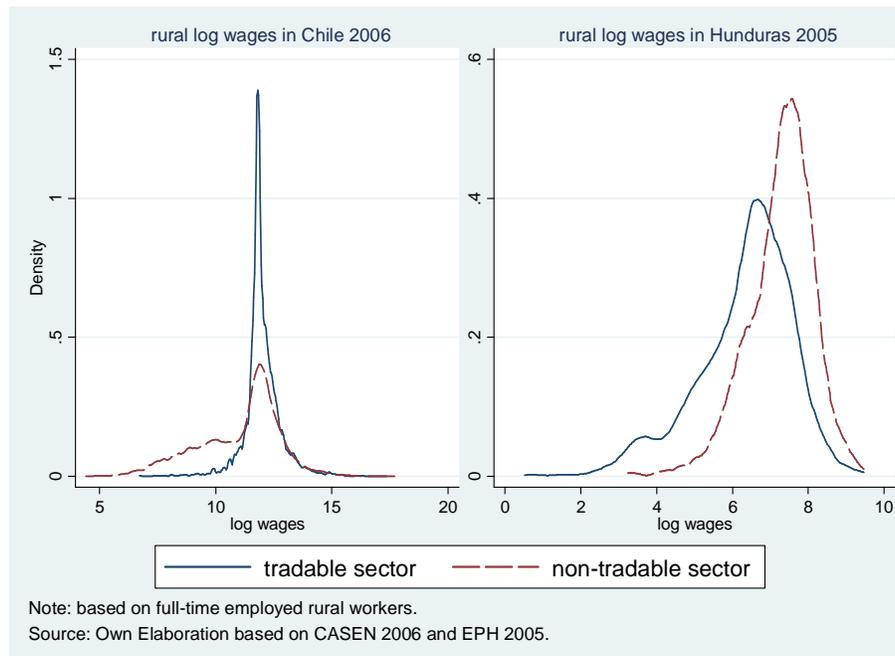
The main purpose of this paper is to consider the existence of a backward sector as an inequality source. It raises the question how to define sectors in a consistent way. Because of the possibility to establish linkages with macro-economic variables, this paper explores the backwardness of the tradable sector, encompassed by the agricultural, mining, and manufacture sectors. The tradable sector produces goods that could eventually be exported. The approach of this paper is based on the idea that rural areas are the natural space where backwardness may take place. Figure 2.1 shows the rural income distribution in Chile and Honduras, illustrating both a non-dualistic and

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<sup>1</sup>Contrary to this, the natural conjecture is that democracy would imply income redistribution toward the relatively poor. In fact, Cornia (2012) suggests that during the last twenty years, many Latin American countries experienced a return to and consolidation of democracy, which possibly affected income inequality through the introduction of more progressive policies.

<sup>2</sup>See Klasen, Otter and Villalobos Barría (2012) on Honduras over the last 20 years.

Figure 1: Non-dualistic and dualistic economies, Chile and Honduras in the mid 2000s.



a well-recognized dualistic economy, respectively. The Honduran case clearly shows that tradable sector lags behind the non-tradable sector. In other words, at each percentile, it is possible to observe a positive wage gap between the tradable and non-tradable sectors (first order stochastic dominance). Interestingly, the impact of the minimum wage appears to be less important in Honduras than in Chile. While in Chile, it contributes to back both distributions on its value, in Honduras, the minimum wage framework contributes to spread the distribution. According to Honduran Secretary for Labour (SENAEH), the minimum daily wage in 2005 ranged between 61.26 and 97.77 *Lempiras* in the agricultural and financial sectors, respectively. This evidence raises the question regarding the role of the minimum wage as an equalization instrument.

The tradable and non-tradable linkages to macro-economic variables have been studied in the literature. Agostin (2007) shows that the real exchange rates (RERs) in LA countries have been unstable, exhibiting strong cyclical fluctuation, associated to financial capital flows. This has proven to negatively affect the evolution of the tradable sector in terms of their volume (exports), diversification, and degree of integration of national economies. French-Davis (2011) argues that the highly cyclical evolution of RERs produces misaligned rates, affecting the volatility of the capital flows. Such volatility distorts investment decisions, promoting speculative and short-run investments, artificially displacing tradables (many produced by small- and medium-scale enterprises). Additionally, it discourages adding value to traditional exports, with regressive effects on employment and employment quality. Moreover, Damill and Frenkel (2012), using a panel OLS estimation

with yearly data covering the period 1990-2010 for the 18 LA countries, find that depreciated real exchange rates (RERs) tend to significantly reduce unemployment (and also underemployment) with a time lag of two years.<sup>3</sup>

Ffrench-Davis (2011) argues that profound adjustments in the exchange policy are required and states:

*Neoliberal views tend to state any exchange intervention involves going against the market, and that this is always defeated by that market. On the contrary, it is about an alternative approach, to achieve the real market forces – export producers and importers, and the producers of importable goods- who are the key players for productive development and equity, should prevail in determining the exchange rate. This is the market that must prevail, and not the market of short-term operators and rent seekers instead of innovation creators and greater productivity. To achieve this consistent and selective intervention by the economic authority is fundamental, and of course is not free of flaws.*

Besides the economic policy aspects, other macro forces are behind the dual equilibrium, such as in the case of Honduras. For instance, natural catastrophes, destroying the stock of capital, contribute to sustain low productivity levels in the traditional sector. Commodity prices may also affect the relative competitiveness of the tradable sector. It is possible that highly volatile commodity prices may discourage investment in the tradable sector increasing non-tradable competitiveness. Knight and Johnson (1997) find evidence on this for the tradable and non-tradable sectors in Australia. Trade policies can also change the relative competitiveness of the tradable sector. Trade frameworks that do not take into account rural backwardness can also accelerate the expansion of import-related sectors and the non-tradable sector. Finally, exogenous capital shocks should be also considered; in particular, aid flows after catastrophes and remittances. These factors are relatively important for small economies. In the same way, Dutch Disease types of impacts are also expected in medium-sized economies due to highly competitive industries. For example, Ruele and Kulkarni (2011) find that the Cooper boom actually contracted the Chilean economy. As expected, such events would increase the gap showed in Figure 2.1 for the Honduran case, and consequences would be expected on the income inequality.

This paper will explore a methodology for isolating the impact on inequality changes produced directly by changes in the relative competitiveness of the tradable sector (instrumented as the wage gap across quantiles between the tradable and non-tradable sectors). However, one should

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<sup>3</sup>Damill and Frenkel (2012) estimate an equation is a variant of Okun's law that takes into account the influence of the RER on the employment-output ratio. The estimations included fixed country-effects to control for the continually diverging levels in national poverty and unemployment rates that are caused by differences in the measurement and definitions as well as in the labour market structures. The estimations also included fixed time-effects controlling for the external shocks.

emphasize that this method is likely to underestimate the complete impact of macro conditions on the wage distribution. In particular, one can well imagine that the macro conditions that caused a favourable shift towards the non-tradable sector not only shifted the entire wage distribution to the right but also affected different portions of the wage distribution differently by changing relevant prices in the labour market.

This paper is broken down as follows: Section 2 reveals a theoretical model supporting the linkage between macroeconomic events and inequality changes, while Section 3 presents an illustration using simulated data. Section 4 offers a description of the proposed methodology. An application using real and simulated is presented in Section 5, while Section 6 concludes this study.

### 1.1 Tradable and Non-Tradable sectors in the rural economy

Consider the rural economy consisting of two sectors: the tradable sector and the non-tradable sector. The tradable sector consists of agriculture, manufacture and mining. The non-tradable sector comprises all other economic activities. In this “classical” model, the tradable sector has available an “unlimited” labour supply at the subsistence wage  $S$  because there is an excess supply of unskilled labour, such that real wages remain unchanged over time.

The non-tradable sector (or at least a significant portion of it) develops more sophisticated activities, which require a higher level of skills; this consequently does not often appeal to individuals in the subsistence sector since, according to Lewis (1954), these will be forced to abandon / relinquish the carefree / easy-going way of life of the subsistence sector.<sup>4</sup> The non-tradable sector on average requires higher skills than the tradable sector so that the non-tradable sector has to pay a higher wage  $W$  which is typically higher than the subsistence wage  $S$ . Moreover, this model assumes inter-sectorial imperfect mobility; this means that only a few workers of the tradable sector may quit their work and compete for a job in the non-tradable sector. For this reason, we observe a positive-sloped labour supply in the non-tradable sector. If the non-tradable sector increases the proportion of workers, it has to pay progressively higher wages over the labour supply line. Figure 2.2 shows the main features of the model.

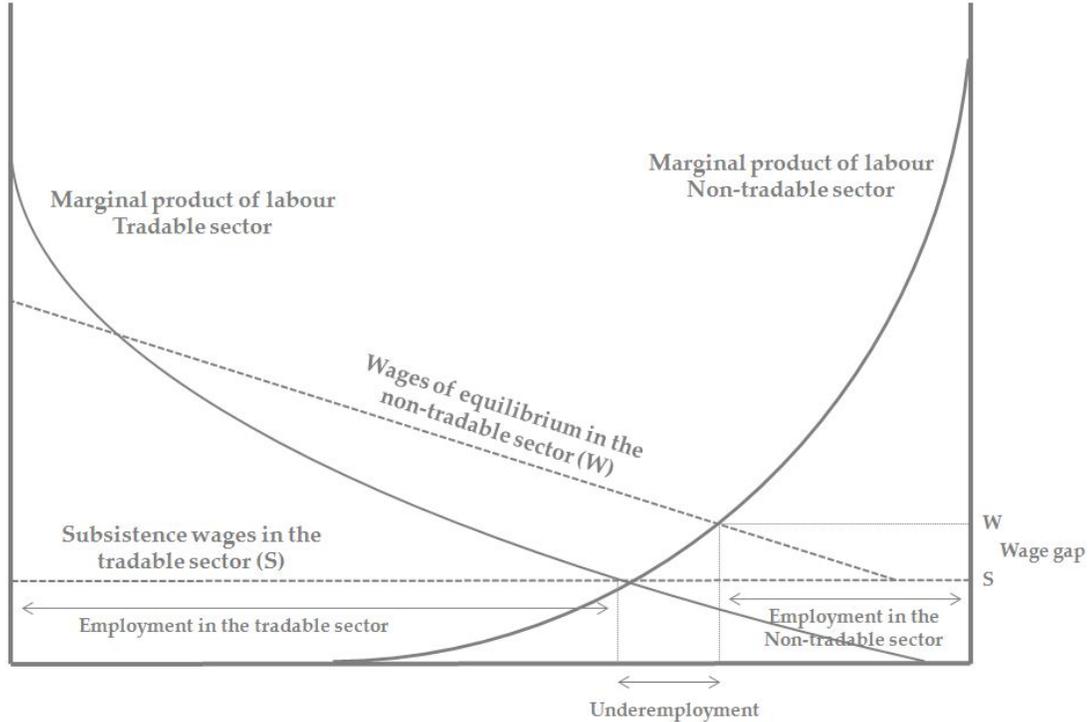
In this model, the wage gap and the underlying underemployment are considered a function of the relative competitiveness of the tradable sector. Regarding this issue, Lewis (1954) argues:

*“Owners of plantations have no interest in seeking knowledge of new techniques or new seeds conveyed to the peasants, and if they are influential in the government, they will not be found using their influence to expand the facilities for agricultural extension”*

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<sup>4</sup>Lewis (1954, p. 150) makes reference to the rural sector in contrast to the urban or modern sector.

Figure 2: The labour market between the tradable and non-tradable sectors



Besides the possibility that plantation owners behave as Lewis states, the context of low profit levels, high depreciation rates, overvaluation of the real exchange rate, volatile international commodity prices can contribute to explain why developing countries evolve in such a dual equilibrium. In the context of an extremely unskilled labour force, the optimal profit strategy can be focused on exploiting cheap labour without an interest in increasing labour productivity levels in the tradable sector.

Higher commodity prices or improved rural education may be seen as an upward shift in the marginal product of the tradable labour curve. High levels of inter-sectorial mobility can contribute to reach in the rural economy the famous “turning point” (see Lewis, 1954). This would induce a positive sloped labour supply in the tradable sector. So that increasing productivities in the non tradable sector, may translate into declining shares of labour in the tradable sector with less underemployment. From here onward, the classical assumption of unlimited labor ceases to hold. As a consequence of this, the wage gap will decrease. In the same way, low levels of inter-sectorial mobility determine that productivity improvements in the non-tradable sector will produce an increase in the wage gap. This is only possible because workers in the tradable sector are unable to abandon this sector and represent an “unlimited” labour supply at the subsistence wage. The underlying force here is the inter-sectorial immobility encouraged by dualistic educational systems.

In summary, the concept behind this model is that there is underemployment in the tradable sector, and labour-market segmentation restricts the access to the predominantly modern non-tradable sector. Consequently, a wage gap between both sectors emerges, depending on relative labour demand conditions and levels of productivity. In the tradable sector, given adverse international market conditions - such as depressed commodity prices and overvalued exchange rates – it may not pay to increase productivity in this sector and wages will stagnate. In contrast, the same conditions will increase wages and revenues in the non-tradable sector of investments, which are also favoured by the external environment.

In this model, we assume workers' heterogeneity (allowing correlation between mobility costs and skills) causing an insufficient mobility of workers between tradable and non-tradable sectors (inducing a positive sloped non-tradable labour supply) and capital-skill complementarity. Therefore, different equilibrium wages across sectors determine the observed wage gap between sectors. Note that this formulation is compatible with the model by Devillanova et al. (2010) which also relies on the complementarity between the two types of labour. The prediction of this formulation is that an economy suffering a sectorial shift against the backward sector will increase the inequality between and within sectors.

## 2 The Methodology

Consider the rural labour income distribution as the combination of the distributions in the tradable and non-tradable sectors. Given the first-order stochastic dominance of the non-tradable log-wage distribution over the tradable distribution, the aggregated rural distribution will be more unequal if both distributions separate each other keeping their respective shapes unchanged.<sup>5</sup> The wage gap described above comes from different skill price-endowments in each sector expressed as different "efficiency wages" (see Mirrlees, 1975 and Basu, 1984).

The key issue in this methodology is to decompose a distributional change of rural earnings into two determinants. On the one hand, a "within-sector" determinant (*WS*), that is, a determinant of inequality changes, which is not directly correlated with returns to the tradable and non-tradable sectors,<sup>6</sup> and on the other, a "between-sector" determinant (*BS*), which captures inequality changes due to variations in the relative returns to the sectors (given a fixed structure of endowments and their returns).<sup>7</sup>

To illustrate the fundamentals of this methodology, consider that the graphs in Figure 2.3 were

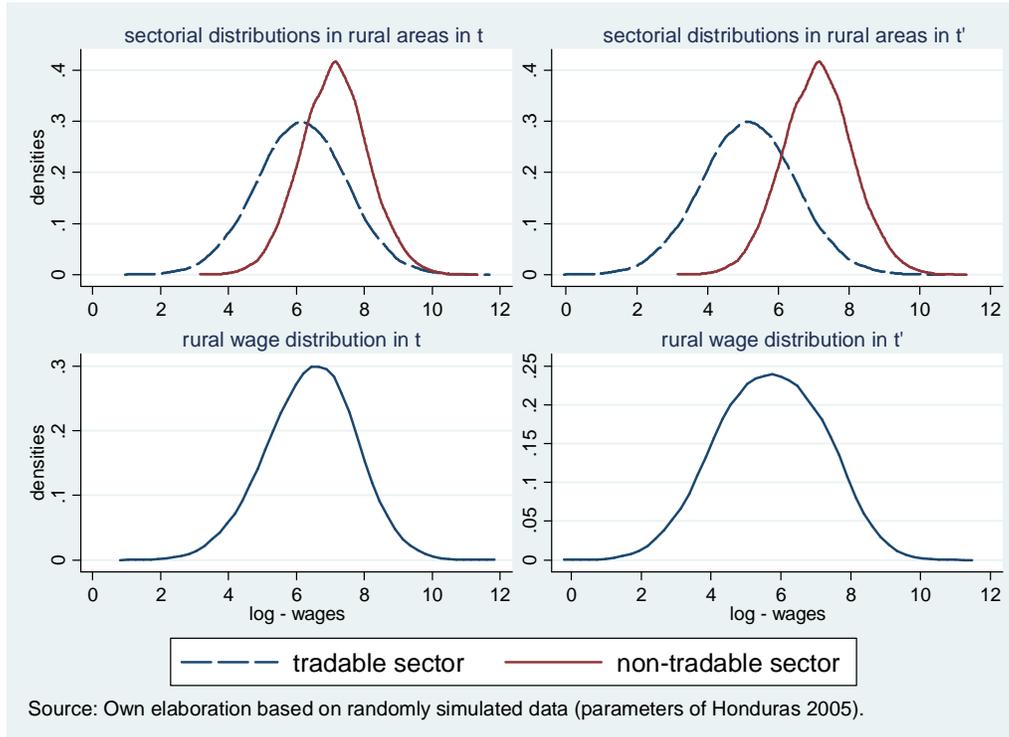
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<sup>5</sup>Klasen, Otter and Villalobos Barría, (2012) show evidence on this for Honduras.

<sup>6</sup>This determinant would reflect inequality changes that may arise by changes in the shapes of both wage density functions.

<sup>7</sup>The "between-sector" determinant captures inequality changes resulting from the horizontal shift of one or both wage density functions, keeping the shapes of their density function constant.

Figure 3: Inter-sectorial wage gap and inequality in rural areas



obtained based on the generation of two normal random distributions, assuming sectorial sizes and distributional moments observed in Honduras in 2005.<sup>8</sup> They represent the tradable and non-tradable sectors of the rural economy.

The top-right graph shows the same distributions depicted in the top-left graph with the only difference that the whole tradable distribution is horizontally “displaced” to the left in one log unit, thus inducing an “artificial” gap between sectors. It is additionally assumed that the *WS* determinant does not exist (implying that the shapes of both density distributions remain unchanged). The bottom panels show the rural distributions obtained by merging the random distributions directly above. It is possible to see that the bottom-left distribution is more equal than its counterpart on the right. In order to estimate effects at the country level, a single urban log wage distribution is considered. It was generated also based on the distributional moments observed in the Honduran labour market in 2005.

Table 2.1 shows the (minimum) contribution to inequality changes as a result of an exogenous change in the wage gap of one log-unit between the tradable and non-tradable sectors. Given a structure of endowments and their returns, an exogenous change favouring backwardness of the

<sup>8</sup>Based on the Honduran specification, the simulation assumes that the tradable sector accounts for the 72% of the employment in rural areas. Urban and rural areas account for 51.6% and 48.4% of the employment respectively. All parameters for the simulated distribution were estimated based on EPH 2005.

tradable sector yields to higher levels of labour earnings inequality and viceversa.<sup>9</sup> Here, the impact is easily to observe because of the simulation explicitly holds returns to endowments constant (shapes unchanged). However, in the real economy, everything changes. Macroeconomic conditions contribute to change returns, and these changes affect the path of endowment accumulation. In highly dualistic economies, shift towards non-tradables and the adverse shift from tradables might have worsened the employment conditions of poorly paid agricultural workers more than better paid workers in the tradable sector. In that sense, our analysis likely represents a lower bound of the impact of macroeconomic conditions on inequality changes.

Table 1: The "macroeconomic" (between sector) wage-gap effect on labour income inequality changes (using Ginis) due to an one unit log wage gap shift.

Area	Gini coeff. in t		Gini Coeff. in t'		Gini change (t'-t)	
	mean	Std. Dev.	mean	Std. Dev.	Points	Percentage
Rural areas	62.40	0.0029	68.20	0.0024	5.86	9.40
Country level	60.29	0.0019	65.28	0.0017	5.02	8.33

Source: Authors' calculations based on 100 Gini simulations of distributions randomly generated. Each distribution consists of 100,000 observations.

## 2.1 Descomposing the distributional change

Based on this decomposition idea, a methodology for decomposing the distributional change in a structural macroeconomic BS effect (wage gap effect) and in a WS effect is presented, as a result of changes in endowments and returns (including those caused indirectly by macroeconomic changes, see below). More formally, we propose an Oaxaca-Blinder type of decomposition, which can be illustrated as follows:

$$\Delta D = D(WS', BS') - D(WS, BS) \quad (1)$$

... where the second period is denoted by " ' ". The distributional change may be decomposed sequentially as follows:

$$\Delta D = [D(WS', BS') - D(WS', BS)] + [D(WS', BS) - D(WS, BS)] \quad (2)$$

Equation (2) indicates that the distributional change may be decomposed in a wage gap effect (between sector) in  $t'$  and a within sector effect as in  $t$ .<sup>10</sup> In order to perform the decomposition, we

<sup>9</sup>Note that the effects are larger at the country level than in rural areas as the rural income distribution is at the bottom of the overall country distribution and a widening of it has a larger proportionate effect on the overall country distribution.

<sup>10</sup>As we can see, there is no path dependence arising in this methodology. As  $\Delta D$  is observed, the decomposition

need to isolate the wage gap change between sectors maintaining the shapes of the wage density functions constant. In other words, we need to find the maximal horizontal shift of the tradable wage density function in  $t'$  which is consistent with the observed rural wage density function in  $t$ .

More precisely, while holding the position of the non-tradable wage density function unchanged as in  $t'$  we need to find and isolate the horizontal shift of the tradable wage density function (from  $t'$  to  $t$ ) which combined then with the change in the shape of both sectorial wage density functions from  $t'$  to  $t$  consistently simulate the whole rural distribution in  $t$ . or:

$$g = \min\{|gap(q)|, \overline{WS'}\} \quad (3)$$

... where  $q$  stands for quantile and  $gap(q)$  is a function indicating the wage gap change as a function of the quantile and  $\overline{WS'}$  represents fixed endowments and returns in both sectors in  $t'$ . If the wage gap change is positive, then the minimum wage gap change will disequalize the distribution of rural earnings; however, if the wage gap change is negative, then the minimum wage gap change will equalize the distribution. Even when the solution of the above minimization problem may yield closed-form first-order and second-order conditions, in the case of non-monotonic wage gap change functions, we rely in a non-parametric technique to find the solution.

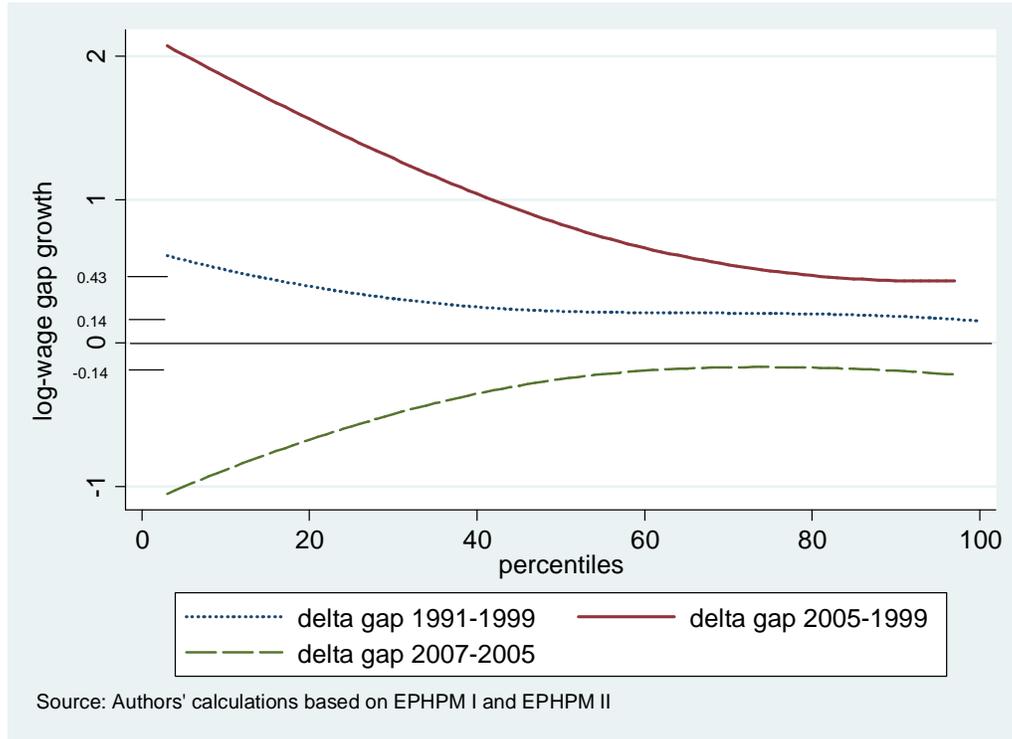
By calculating and constructing sectorial Pen's parades, it is possible to derive a growth incidence curve of the between-sector wage gap  $gap(q)$ . Each Pen's parade is estimated for the tradable and non-tradable labour earnings distributions in  $t$  and  $t'$ . Once  $g$  in the equation (3) is derived (in the simulation above  $g = 1$ ), we shift the tradable distribution by adding  $g$  to the entire distribution of earnings in the tradable sector in  $t'$ . Thus, we simulate  $D(WS', BS)$  in (2), which is the simulated rural distribution with returns and endowment in  $t'$  and the wage gap in  $t$ . As we already know  $D(WS, BS)$ , which is the observed rural distribution in  $t$ , and  $D(WS', BS')$ , which is the observed rural distribution in  $t'$ , it is possible to estimate equation (2), and decompose labour inequality changes as mentioned.

## 2.2 An application using real and simulated data

The application using real data is taken from Klasen et al. (2012). Figure 2.4 shows three growth incidence curves of the wage gap or  $gap(q)$  observed in Honduras during the periods 1991-1999, 1999-2005 and 2005-2007. In this real data,  $g = \min\{|gap(q)|, \overline{WS'}\}$  is equal to 0.14, 0.43 and -0.14 log units for the three periods respectively.

The simulated data is based on the distributional moments observed in Honduras in 1999 and only requires an estimation of  $D(WS', BS)$ . The BS effect can be easily calculated estimating the first term in equation (2).

Figure 4: Honduran growth incidence curves of the inter-sectorial wage gap in rural areas



2005. Assuming that  $g$  is equal to 0.43,  $D(WS', BS)$  is simulated. Table 2.2 shows the contribution of the  $BS$  determinant to the inequality change using simulated data.

Table 2: The "macroeconomic" (between sector) wage-gap effect on labour income inequality changes (using GINIs), simulated data

	Observed distributions		displaced distributions ( $g=0.43$ )		% of Change	
	Rural	Country	Rural	Country	Rural	Country
1999	56.73	56.54	-	-	-	-
2005	62.40	60.29	61.95	58.93	7.96	36.24

Note: The  $BS$  determinant or  $[D(WS', BS') - D(WS', BS)]$  is obtained by comparing the observed distribution in 2005 and the displaced distribution ( $g=0.43$ ).

Source: Own calculations based on data simulated data.

Now, Table 2.3 shows the contribution of the  $BS$  determinant to the inequality change using the observed data in the Honduran economy. Appended in this table are the contributions depicted in Table 2.2. As expected, the contribution to inequality changes of increasing conditional gaps being consistent with the observed inequality changes in Honduras over time.<sup>11</sup> Between 1991 and 1999, results show that the exogenous macroeconomic shift between the tradable and non-tradable

<sup>11</sup>See Klasen et. al. (2012).

sectors explains a minimum of 7.5 of the observed disequalization at the country level. The contribution tends to be higher in the later periods contributing up to almost 40% of the disequalization between 1999 and 2005.<sup>12</sup> Results based on simulated data are surprisingly similar to those based on real data. This means that the procedure can rely on the assumption that log-monthly wages are well-behaved, and it can therefore be used to isolate the contribution to inequality changes caused by the BS determinant.

Table 3: The "macroeconomic" (between sector) wage-gap effect on labour income inequality changes (using Ginis), Honduran and simulated data

Year	% of change - Rural distribution		% of change - country-level distribution	
	Observed gap	Simulated gap	Observed gap	Simulated gap
1991-1999	3.06	-	7.53	-
1999-2005	7.66	7.96	39.11	36.24
2005-2007	-12.38	-	-33.67	-

Source: Own elaboration based on data from EPHPM I and EPHPM II, and random data.

## 2.3 Conclusions

This paper presents a way to explore how macroeconomic shifts cause inequality changes. It is based on the backwardness observed in the agricultural sector in rural areas. Assuming that an inter-sectorial wage gap exists, this methodology allows control over the direct impact on inequality changes caused by macroeconomic changes that affects the relative competitiveness between the tradable and non-tradable sectors. The methodology aims to find the wage gap change (in log units) taking place between two points in time, which is not dependent on the distribution of endowments of the employed population (observed and unobserved characteristics).

First, this paper shows why highly dualistic economies tend to be more unequal than economies with flexible and integrated labour markets. Second, the methodology allows for quantifying the role of direct macroeconomic events on inequality changes. The application here presented shows that almost 40% of the disequalization experienced by the Honduran economy may find their primary cause in macro-conditions (though it does not consider how it affects microeconomic conditions). Klasen et al. (2012) argues that declining commodity prices is the main macroeconomic force behind the labour income disequalization between 1999 and 2005. Simulated data confirms the results in Klasen et. al. (2012).

The decomposition methodologies support the conclusions by Devillanova et al. (2010) suggesting a channel through which trade integration can affect the wage inequality in a context of capital-skill complementarity and imperfect mobility of workers. The story that follows is that a shift

<sup>12</sup>Note that the effects are larger at the country level than in rural areas as the rural income distribution is at the bottom of the overall country distribution and a widening of it has a larger proportionate effect on the overall country distribution.

towards the non-tradable sector increases in this sector the skill intensity and skill premium (observed and unobserved ability). This evolution regarding skill intensity and skill premium is backed up by our results regarding the impact of unobservables on inequality in a rural economy characterized by duality. At the same time, relative wages for less-educated workers also increase in the dynamic sector compared to those in the tradable sector (due to the imperfect mobility). Consequently, skilled and unskilled workers now perform better in the non-tradable sector (relative to those in the tradable sector). In the same manner, the labour income distribution becomes more unequal due to the evolution of the inter-sectorial wage gap taking place across the whole ability distribution.

Policies oriented towards eliminating the systematic backwardness appear to be highly desirable in such economies. Improvement in the relative competitiveness of the small-scale agricultural activities is consistent with increased rural employment, a reduction in rural underemployment, increasing wages in the tradable sector, a reduction in the wage gap and consequently, declining inequality levels. As usual, poverty levels are higher in rural areas and amongst those related to agricultural activities. To fight backwardness is thus very similar to reducing poverty and decreasing inequality.

Finally, to use fiscal and monetary policy to support the depressed tradable sector appears to be consistent with a rational development strategy in such countries. Among the set of policies that may be used to achieve this goal, it is possible to mention the depreciation of the nominal exchange rate, the attainment of asymmetric trade agreements that recognize the backwardness, allowing the imposition of import tariffs and/or export incentives when such backwardness is observed, and the improvement of the rural infrastructure. However, in the long run, it is more important to eliminate the sources of immobility across sectors, which immobility forces usually find their explanation in insufficient and outdated educational systems. Therefore, international development assistance should focus principally on improving the coverage and quality of education and infrastructure mainly in rural areas. Additionally, to guarantee minimum prices for the production of the backward sector may also be considered.

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## Appendix

### Description of the simulation procedure

The simulation procedure aims to avoid the possibility that initial conditions could drive the characteristics of the simulated distributions (e.i. the respective Gini coefficient). In order to achieve this goal, initial parameters log normal distributions were taken from the observed distribution in Honduras in 1999 and 2005. Table B.1 shows the mean and standard deviation of the log monthly earnings observed in these years according to EPH 1999 and 2005 in real terms.

Table 4: Distributional moments of the log monthly earnings, Honduras 1999 and 2005

Distribution	EPH - 1999		EPH - 2005	
	mean	std. Dev.	mean	std. Dev.
Rural area - tradable sector	6.658	1.076	6.158	1.336
Rural area - non-tradable sector	6.848	1.140	7.115	0.988
Urban areas	7.471	0.988	7.537	1.013

Source: Own elaboration based on data from EPHPM 1999 and 2005.

Using these distributional moments, we proceed to generate randomly normal distribution of size  $N=100,000$ . We truncate each distribution so that the final size of the distribution corresponds to those observed in 1999 and 2005.<sup>13</sup> However, for the purposes of this simulation, it was necessary to repeat this procedure 100 times. Afterwards, we proceed to replicate tradable, non-tradable and urban distribution 100 times based on underlying populations of size equals to 100,000. Then, by merging tradable and non-tradable distribution it was possible to create rural distributions. Subsequently, by merging rural and urban distribution, we obtained the distributions at the Country level. As a result, this simulation creates 100 rural and 100 country-level distributions. The procedure follows calculating the Gini coefficient for each distribution and bootstrapping them 100 times excluding each time the 10% of the observations. Finally, the reported Gini is the average of the bootstrap Gini coefficients with 100 repetitions. The coefficient of variation of the estimated Gini coefficients does not exceed the 0.5%. In other words, the methodology proves to be effective in making our results independent of the initial conditions.

Table 5: Observed and Simulated Gini coefficient using observed distributional moments reported in Table B.1 in Appendix B

Distributions	Gini coeff. - 1999		Gini coeff. - 2005		Δ Gini	
	Simulated	Observed	Simulated	Observed	Simulated	Observed
Rural	56.73	55.13	62.40	60.88	5.68	5.75
Country	56.54	54.52	60.29	57.00	3.75	2.48

Source: Own elaboration based on data from EPHPM 1999 and 2005, and random data.

<sup>13</sup>The illustration of these rural distributions can be seen in the right panel of Figure 2.3.