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FISCAL POLICY, SECTORAL ALLOCATION, AND THE SKILL PREMIUM: EXPLAINING THE DECLINE IN LATIN AMERICA'S INCOME INEQUALITY*

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Abstract

This paper offers an explanation for the substantial decline in income inequality in Latin America during the 2000s, which is known to have been mainly driven by a decline in the skill premium. The 2000s were characterized by an economic expansion concentrated on low-skill-intensive service sectors. The expansion induced an increase in the demand for low-skilled labor relative to high-skilled labor, which compressed the skill premium. Procyclical fiscal policy exacerbated the distributional effects of the boom by contributing to the growth of the service sector. I first document the expansion was concentrated on services while manufacturing lagged behind, and show declining inequality is associated with procyclical fiscal policy. I then rationalize the evidence using a small open economy DSGE model that features a low-skill-intensive nontradable sector relative to the tradable sector, and procyclical government purchases. This framework implies that at least part of the decline in inequality is transitory, a prediction supported by recent data.

Resumen

Este artículo ofrece una explicación para la sustancial reducción de la desigualdad del ingreso en América Latina durante los años 2000, la cual se sabe asociada a una reducción de la brecha salarial entre trabajadores calificados y poco calificados. Los años 2000 se caracterizaron por una expansión económica concentrada en sectores de servicios intensivos en trabajo poco calificado. Esta expansión generó un aumento en la demanda por trabajo poco calificado respecto al trabajo calificado, lo que comprimió la brecha salarial entre los dos tipos de trabajadores. Una política fiscal procíclica exacerbó los efectos distributivos del auge al contribuir al crecimiento del sector servicios. En primer lugar muestro que la expansión latinoamericana se concentró en servicios, mientras el sector manufacturero se mantuvo rezagado, y que la caída en la desigualdad está asociada a una política fiscal procíclica. En segundo lugar utilizo un modelo dinámico estocástico de equilibrio general (DSGE por sus siglas en inglés) de una economía pequeña y abierta para racionalizar la evidencia empírica. El modelo contempla un sector no transable intensivo en trabajo poco calificado respecto al sector transable, y compras públicas procíclicas. Este marco analítico implica que al menos parte de la caída de la desigualdad es transitoria. Datos recientes soportan esta predicción.

* I thank Bart Moore and Johanna Francis for detailed suggestions, and Emiliano Luttini and participants at Sociedad de Economía de Chile for comments. The views in this document are those of the author and do not represent official positions of the Central Bank of Chile or its Board members. Email: jguerra@bcentral.cl.

1 Introduction

At least since the first half of the 20th century, Latin America has been the most unequal region in the world (Williamson (2009)). It is well known, however, that income inequality declined substantially during the 2000s, and that it was mainly driven by a decline in the skill premium.[1] Figure 1 shows the average annual percent change in the Gini coefficient for 16 Latin American and Caribbean countries between 2000 and 2010. All countries, except Costa Rica, experienced a sustained decline in income inequality during this period. A simple average across countries suggests inequality fell at a rate of 0.9 percent per year in the region.[2] This was not the case before the 2000s. Gasparini and Lustig (2011) document rising inequality during the 1980s and 1990s, and a reversal during the 2000s. Figure 2 shows the evolution of Gini coefficient estimates of pre-tax, pre-transfer income in six countries between 1990 and 2012. Inequality declined significantly throughout the 2000s in most of them, while it remained stable or increased throughout the 1990s.

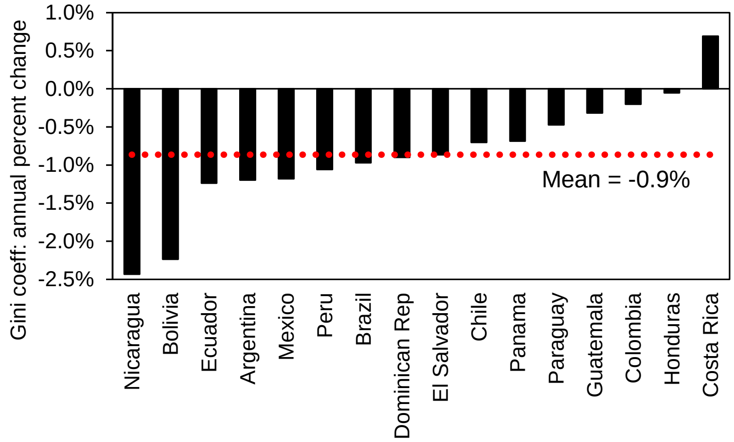
This paper offers the following explanation for Latin America's declining income inequality during the 2000s. This period was characterized by an economic expansion concentrated on low-skill-intensive service sectors. The expansion induced an increase in the demand for low-skilled labor relative to high-skilled labor, which compressed the skill premium. Procyclical fiscal policy exacerbated the distributional effects of the expansion by contributing to the growth of the service sector.

I document three features of the Latin American economy during the 2000s. First, it experienced an economic expansion concentrated on low-skill-intensive services, whereas sectors such as manufacturing lagged behind. Second, the real exchange rate appreciated. And third, there is an inverse relation between income inequality and fiscal procyclicality

[1] A large microeconometric literature finds that a decline in the skill premium is the most important driver of the decline in income inequality in the 2000s. See, for example, Lustig, López-Calva, and Ortiz-Juárez (2013), and the essays collected in the volume edited by López-Calva and Lustig (2010).

[2] The decline in income inequality in the 2000s is robust to other measures. Cord et al. (2014) document a decline in income inequality using growth incidence curves, income concentration indicators, the Theil index of inequality, the mean log deviation, the ratio between the 90th and the 10th percentile, and the Atkinson index.

Figure 1: Income Inequality in Latin America (2000–10)



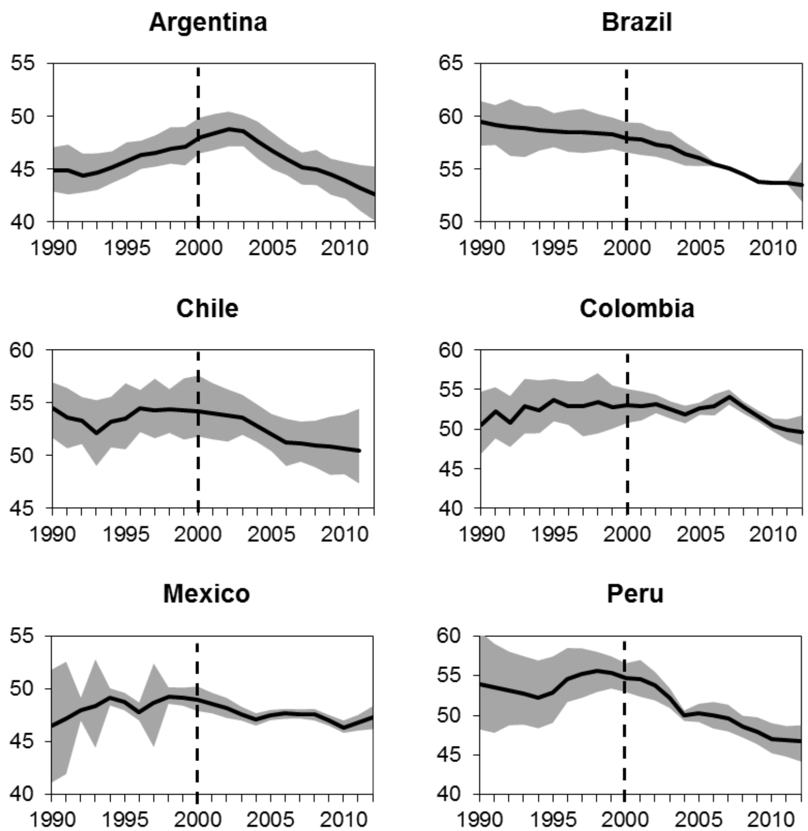
The average annual percent change in the Gini coefficient is computed as $[(Gini_T - Gini_t)/Gini_t][T-t+1]^{-1}$, where $Gini_T$ is the Gini coefficient at the final date and $Gini_t$ at the initial date.
Source: Author's calculations based on data from the Socio-Economic Database for Latin America and the Caribbean—SEDLAC (CEDLAS and The World Bank), October 2014.

during the 2000s, i.e., countries that pursued more procyclical policies tended to experience larger drops in inequality.

I then use a small open economy two-sector DSGE model featuring high- and low-skilled workers to rationalize the evidence. In the model, an expansionary demand shock leads to reallocation from the tradable to the nontradable sector, a Dutch-Disease type of effect. If the nontradable sector is relatively intensive in low-skilled labor, low-skilled wages are bid up and the wage premium earned by high-skilled workers falls. Procyclical government purchases exacerbate the effects of the expansionary shock on the skill premium, since higher public demand amplifies sectoral reallocation.

I calibrate the model to Argentina and conduct counterfactual policy experiments to understand the role of fiscal procyclicality in the decline of the premium. Government expenditure is strongly procyclical in Argentina. In the counterfactual experiments, I ask how the skill premium would have evolved under *acyclical* and *countercyclical* fiscal policies. An acyclical policy is characterized by government purchases that do not respond to the output gap. Under the countercyclical policy, the behavior of government purchases over the busi-

Figure 2: Evolution of Income Inequality in Selected Latin American Countries



Gini coefficient on market income (pre-tax, pre-transfer). Solid lines are mean estimates; shaded regions denote 95 percent confidence intervals.
Source: The Standardized World Income Inequality Database v5.0, October 2014. See Solt (forthcoming) for details.

ness cycle mimics that in Chile, a Latin American country that follows a structural balance fiscal rule that leads to countercyclical policy.[3] I find that the skill premium would have declined substantially less under an acyclical policy, and even less under the countercyclical policy. The cumulative response of the premium to an expansionary shock, 10 quarters after it hits the economy, is 40 percent smaller under the countercyclical policy than under the procyclical policy in the baseline calibration.

This paper appeals to cyclical forces to explain Latin America's declining inequality. Therefore, it implies that inequality should *increase*, or at least decline at a slower rate, during an economic downturn. Recent data support this prediction. Since about 2012, inequality has stagnated in Latin America at the same time that growth in the region has slowed. This phenomenon has been thoroughly documented by Cord et al. (2014) and World Bank (2014).

The rest of the paper is organized as follows. The next section reviews the related literature. Section 3 documents three features of the Latin American economy during the 2000s. Section 4 spells out a small open economy DSGE model that can rationalize the evidence. I discuss the calibration of the model in section 5, and put the model to work in section 6, in which I study the role of sectoral allocation and alternative fiscal policy rules on the evolution of the skill premium. Section 7 concludes.

2 Related Literature

This paper is related to four strands of the economic literature. The first is the literature on the effects of allocation among the tradable and nontradable sectors. Reallocation among the two sectors is central to the explanation macroeconomic phenomena such as the so-called Dutch disease (Corden and Neary (1982), Corden (1984)), the role of terms-of-trade shocks as drivers of business cycles (Mendoza (1995)), and the macroeconomic effects of capital

[3]For analyses of the Chilean fiscal rule, see Medina and Soto (2007), Frankel (2013), and Kumhof and Laxton (2009).

inflows (Benigno, Converse, and Fornaro (2015)). Little is known, however, about its role in explaining distributional issues. In the DSGE model developed in this paper, a shock that induces reallocation among the two sectors has an important effect on the skill premium, and by extension, on income inequality. Different skill intensities in the tradable and nontradable sectors lie at the heart of this effect. Other papers in which sectoral reallocation affects income distribution include Galiani, Heymann, and Magud (2010), and Coble and Magud (2010).

The second strand of the literature related to this paper studies the cyclical effects of fiscal policy. It has established, for example, that policy is mostly procyclical in developing countries, Latin American in particular, whereas it is acyclical or countercyclical in developed countries (Gavin and Perotti (1997), Frankel, Végh, and Vuletin (2013), Ilzetzki and Végh (2008)). It also features ample research on the ability of countercyclical fiscal policy to mitigate cycles (Hall (2009), Leeper, Walker, and Yang (2010), Medina and Soto (2007)), including under liquidity-trap conditions (Christiano, Eichenbaum, and Rebelo (2011), Eggertsson (2010)). But the role of the cyclical stance of fiscal policy on the evolution of income inequality at business cycle frequencies has been scarcely explored; Lim and McNelis (2013) is an exception. In this paper, procyclical fiscal policy amplifies the effect of aggregate demand shocks on the skill premium, and thus, on income inequality.

The paper is also related to a literature on the business cycle and income inequality focused on the United States.[4] It establishes that inequality data display fluctuations at business cycle frequencies and develops models to fit the data (Castañeda, Díaz-Giménez, and Ríos-Rull (1998), Maliar, Maliar, and Mora (2005), Barlevy and Tsiddon (2006)). Lindquist (2004) studies the evolution of the skill premium over the U.S. business cycle using a DSGE model that features capital-skill complementarity. I study the evolution of the skill premium in Latin America during the booming 2000s using a two-sector DSGE model.

A recent literature, primarily microeconometric, analyzes the drivers behind the decline

[4] García and Pérez-Núñez (2015) offer an empirical analysis of income inequality over the business cycle for the case of Chile.

in income inequality in Latin America during the 2000s. A common finding is that *labor income*, as opposed to other sources such as government transfers, remittances, and pensions, drives the decline in inequality. More specifically, this literature finds that the *skill premium* is the key driver. Azevedo, Inchauste, and Sanfelice (2013b) estimate that labor income accounts for 54 percent of the fall in income inequality, whereas transfers explain 21 percent. Azevedo et al. (2013a), Gasparini et al. (2011), Tsounta and Osueke (2014), and many other authors then argue that the falling skill premium is the cause of the equalizing effect of labor income, as opposed, for example, to a more equal distribution of skills. I contribute to this literature with a macroeconomic general equilibrium perspective that sheds light on the underlying sources of the decline in the skill premium.

The declining skill premium plays a paramount role in Latin America's declining inequality. In this paper, it is mainly driven by an increase in the relative *demand* for low-skilled workers. There is no consensus, however, on the forces behind the decline in the premium.[5] Gasparini et al. (2011) apply the seminal microeconometric framework due to Katz and Murphy (1992) to Latin America and find that demand factors explain most of the decline in the skill premium in the 2000s, as opposed to supply factors such as educational upgrading. There is a limited discussion on the effect of the business cycle on the shifts in labor demand. Gasparini et al. (2011) find a negative relation between the terms of trade and the skill premium, which is consistent with a boom fueled by favorable commodity prices during which income inequality declines. Galiani, Heymann, and Magud (2010) and Coble and Magud (2010) consider the role of different skill intensities across sectors as a channel through which changes in the terms of trade affect the skill premium. Consistently with my framework, their analysis implies that positive terms-of-trade shocks that favor the nontradable sector at the expense of the tradable sector (a Dutch disease-type effect) would lead to a decline in the skill premium if the nontradable sector is relatively more intensive in low-skilled labor. Distinguishing features of my framework are that I study a dynamic model, and that

[5] See Lustig, López-Calva, and Ortiz-Juárez (2013) for a discussion of this lack of consensus.

I consider the role of fiscal policy as a mechanism that propagates the distributional effects of macroeconomic shocks.

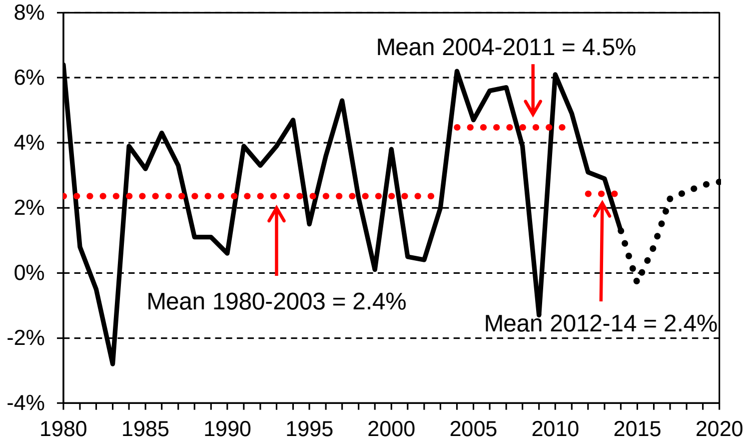
This paper focuses on the role of varying skill intensities across tradable and nontradable sectors, but there are other factors that could affect the demand for labor of different skill levels. One such factor is technological change associated with trade liberalizations. It is possible, for instance, that the wave of trade liberalization that swept Latin America in the 1990s induced skill-biased technical change by facilitating access to capital goods, inducing an increase in the skill premium, and that the demand for high-skilled workers receded in the 2000s as the gains from liberalization were realized. Papers that study the effect of trade policy on the skill premium include Galiani and Porto (2010), Acosta and Gasparini (2007), and Galiani and Sanguinetti (2003), among others.

A group of papers argues that the fall in Latin America's skill premium is mainly driven by an increase in the supply of high-skilled labor due to the expansion of educational enrollment and attainment, perhaps as a result of higher public investment in education (Azevedo et al. (2013a), Tsounta and Osueke (2014), Cruces, García Domenech, and Gasparini (2011)). It is likely, of course, that supply-side factors play a role in the declining premium, but it is difficult to explain the recent reversal towards higher inequality without appealing to demand factors.

3 Evidence

This section documents three key features of the Latin American economy consistent with the hypothesis that sectoral allocation and procyclical fiscal policy contributed to the decline in the skill premium during the 2000s. But before presenting this evidence, figure 3 shows the well known and substantial economic expansion the region experienced in this period. Real GDP growth was low and volatile during the 1980s and 1990s, often called the region's "two lost decades," but between 2004 and 2011, GDP grew by more than 4 percent every

Figure 3: Real GDP Growth in Latin America and the Caribbean



Source: IMF, WEO database, October 2015.

year except 2009, when the global financial crisis brought growth to -1.3 percent.[6]

3.1 The Economic Expansion by Sector

The first key feature of the Latin American economy consistent with the paper's argument is that service sectors grew far more than others such as manufacturing during the boom of the 2000s. Figure 4 shows that the boom was concentrated on three sectors typically considered of nontradable nature:[7] *a*) construction; *b*) wholesale, retail trade, restaurants and hotels; and *c*) transport, storage and communication. Between 2003 and 2010, value added in these three groupings grew by 48 percent on average, whereas total value added grew by 34 percent. Manufacturing, as well as agriculture and mining, sectors typically considered tradable, lagged behind total value added and the nontradable sectors. Manufacturing grew by 25 percent, half the growth of the leading service sectors. "Other activities," a category that includes finance, business services, public administration, teaching, and other presumably high-skill-intensive services, grew by 34 percent, the same rate as total value added.[8,9]

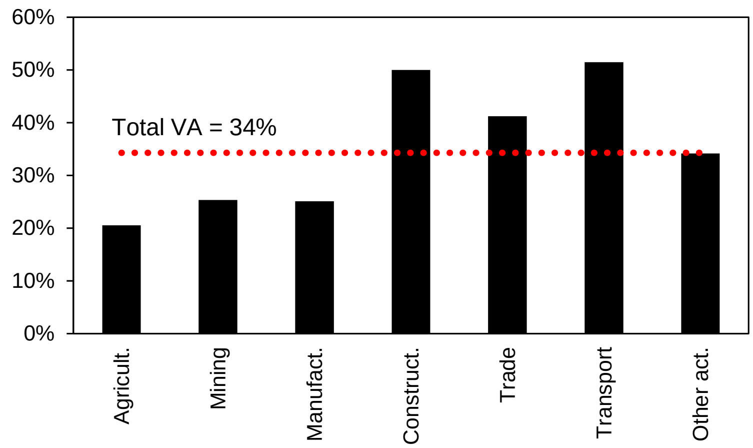
[6] Growth was 3.9 percent in 2008.

[7] See the note to figure 4 for a list of countries considered.

[8] The group "other activities" also includes domestic servants.

[9] These results are robust to the averaging method (population-weighted versus simple averages) and to the countries in the sample. The technical appendix contains detailed data on the growth of value added by

Figure 4: Cumulative Growth in Value Added (2003–2010)



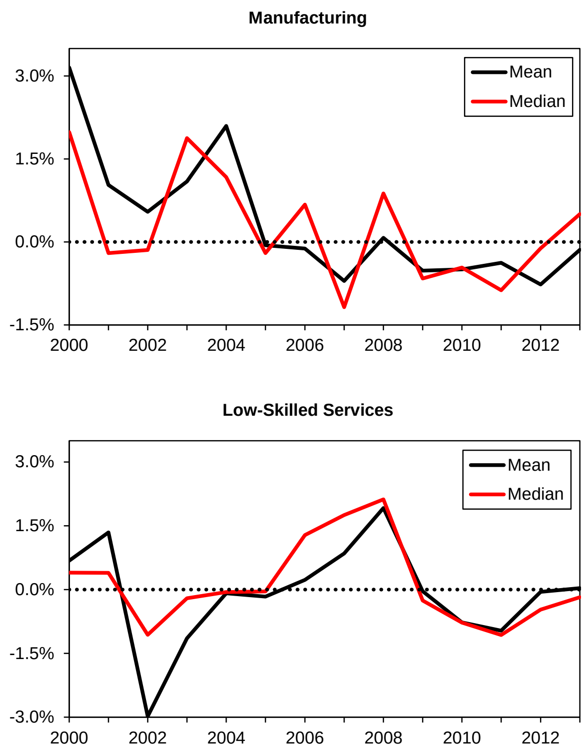
Population-weighted average growth of value added. Growth is the percent difference between the final and initial year. ISIC 3.0 classification of economic activities: Agriculture, hunting, forestry, fishing (ISIC A-B); Mining, manufacturing, utilities (ISIC C-E); Manufacturing (ISIC D); Construction (ISIC F); Wholesale, retail trade, restaurants and hotels (ISIC G-H); Transport, storage and communication (ISIC I); Other activities (ISIC J-P). The countries considered are: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Honduras, Mexico, Panama, Paraguay, and Peru.
Source: Author's calculations based on data from the United Nations Statistics Division, December 2014.

The results on cumulative sectoral growth shown in figure 4 have a potential drawback. There seems to be a declining trend in the share of manufacturing and an increasing trend in the share of services in Latin America as well as other advanced and emerging regions. Thus, figure 4 could be reflecting a secular sectoral shift rather than a characteristic of Latin America's boom of the 2000s. To address this potential drawback, I follow Benigno, Converse, and Fornaro (2015) and detrend the sectoral shares of manufacturing and low-skilled services (the grouping that includes the three leading service sectors) using the Hodrick-Prescott filter. Figure 5 shows the cyclical evolution of sectoral shares in value added. The figure presents the mean and median shares among the same sample of countries included in figure 4. There is a clear cyclical contraction in the share of manufacturing in value added and an expansion in the share of low-skilled services throughout the 2000s.

While there is no regional evidence on years of education or experience by sector, which would be natural proxies of skill intensities by sector, Mano and Castillo (2015) find that

sector for different country samples and averaging methods.

Figure 5: Cyclical Evolution of Sectoral Shares in Value Added



Mean and median evolution of sectoral shares in value added in 14 countries (see note to figure 4 for the list of countries). Log deviations from HP trend ($\lambda = 100$). Low-skilled services include (ISIC 3.0 codes in parenthesis): Construction (F); wholesale, retail trade, restaurants and hotels (G-H); transport, storage and communication (I).
Source: Author's calculations based on data from the United Nations Statistics Division, December 2014.

labor productivity, defined as real value added per worker, is substantially higher in the tradable sector than in the nontradable sector, in Latin America and other regions. More productive workers are likely to be more skilled, so it is reasonable to believe that the nontradable sector is relatively more intensive in low-skilled labor.[10,11]

3.2 The Real Exchange Rate

Growth concentration in the nontradable service sector is a Dutch-Disease type of phenomenon that would presumably be associated to a real exchange rate appreciation. Figure 6 shows this was indeed the case in Latin America during the 2000s. It shows average real exchange rates (simple and population-weighted averages) for a group of Latin American countries in solid lines, and red trend lines for the period 2003:M1–2010:M12. The left column of the figure shows real exchange indices with respect to the US, whereas the right column shows multilateral indices. All four panels suggest the real exchange rate appreciated during the 2000s, with stronger appreciations in bilateral terms against the US.

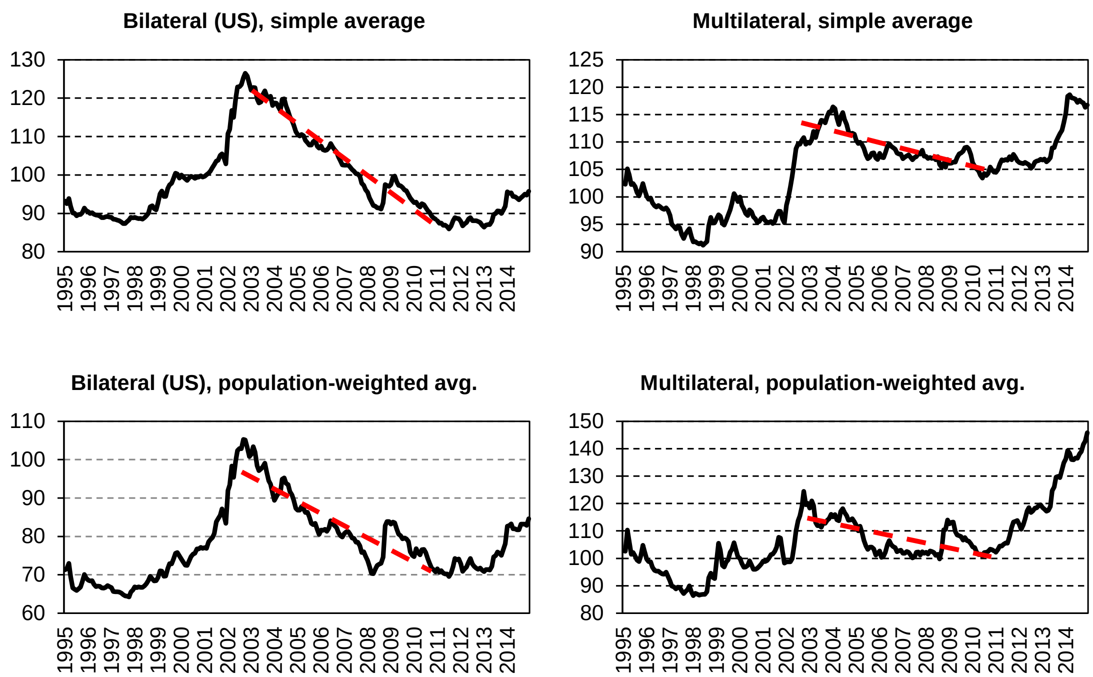
3.3 The Relation Between Fiscal Procyclicality and Inequality

A third key feature of Latin America's economy is that there is an inverse relation between fiscal procyclicality and income inequality among countries in the region. Countries that pursued a more procyclical fiscal policy tended to experience a sharper decline in income inequality. Figure 7 plots the average annual percent change in the Gini coefficient against the correlation coefficient between the cyclical components of government expenditure and

[10] Mano and Castillo (2015) find productivity in the tradable sector is about 35–50 percent higher than in the nontradable sector in Latin America, depending on the classification of industries as traded/nontraded. These results consider data for Argentina, Brazil, Chile, and Mexico.

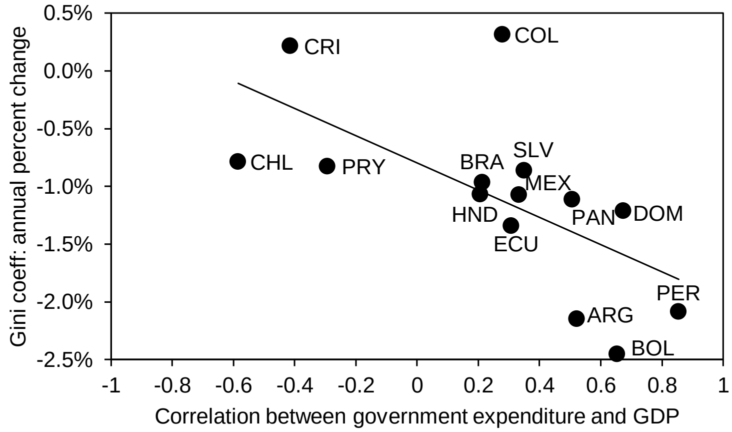
[11] It is possible, of course, that workers in the tradable sector are more productive because they have access to more and/or better capital while being less skilled than their counterparts in the nontradable sector. This is unlikely, however, in light of the evidence on "capital-skill complementarity," the idea that more advanced equipment is relatively more complementary to high-skilled than low-skilled workers. See Krusell et al. (2000) for an important application to the U.S. and Duffy, Papageorgiou, and Perez-Sebastian (2004) for evidence on a panel of developed and developing countries.

Figure 6: Real Exchange Rate (2003–2010)



Decreases denote appreciation. Cross-country averages of monthly indices (January 2000=100). Bilateral rates (figures on left column) consider 14 countries (see note to figure 4 for a list of countries). Multilateral rates (right column) consider 12 countries: the 14 countries in the previous calculations, except Panama and Paraguay, for which the database does not contain data.
Source: Author's calculations based on data from the Latin Macro Watch database (Inter-American Development Bank).

Figure 7: The Relation Between Fiscal Procyclicality and Income Inequality (2003–10)



The average annual percent change in the Gini coefficient is computed as explained in the note to figure 1. The correlation between government expenditure and GDP from 2003 to 2010 uses cyclical components extracted from an annual sample ranging from 1990 to 2013 for most countries (log deviations from a Hodrick-Prescott trend).

Source: Author's calculations based on inequality data from SEDLAC (CEDLAS and The World Bank), government expenditure data from the Latin Macro Watch database (Inter-American Development Bank), and GDP data from the World Development Indicators (The World Bank).

GDP, a simple measure of fiscal procyclicality.[12,13]

The three countries where income inequality decreased more sharply between 2003 and 2010 are Bolivia, Argentina and Peru. The Gini coefficient decreased more than 2 percent per annum for all three during the sample. These countries are also characterized by high fiscal procyclicality, as the correlation between government expenditure and GDP exceeds 0.5 for all of them, reaching 0.85 in the case of Peru.

Fiscal policy is countercyclical in three countries—Chile, Costa Rica and Paraguay—in the sense that the correlation between government expenditure and GDP is negative. In these countries, inequality declined more modestly, or increased slightly. In Chile and Paraguay,

[12]The measure of fiscal procyclicality uses annual data on real GDP and total government expenditure. Their cyclical components result from removing HP trends ($\lambda = 100$). For most countries, the sample used in the HP-filtering is 1990–2013.

[13]Other papers that measure fiscal procyclicality as the correlation coefficient between government expenditure and GDP include Frankel, Végh, and Vuletin (2013), Kaminsky, Reinhart, and Végh (2004), and Talvi and Végh (2005). A limitation of this measure is that it does not deal with reverse causality between government expenditure and the macroeconomy. However, Ilzetzki and Végh (2008) address this issue using several econometric tests and confirm that fiscal policy is procyclical in developing countries.

inequality decreased at around 0.8 percent per annum, while it seems to have increased slightly in Costa Rica.

Most of the countries in the sample feature a moderately procyclical fiscal policy, with a correlation between expenditure and GDP between 0.2 and 0.5, and an average decline of inequality of 1–1.5 percent per year. Brazil, Ecuador, El Salvador, Mexico, Honduras, and Panama are in this group. Colombia is an outlier; inequality increased slightly while the government implemented a moderately procyclical fiscal policy.

The inverse relation between fiscal procyclicality and income inequality is robust to the sample period and the sample of countries. The technical appendix documents this relation holds for 2000–2010 and 2003–2008. It also shows it is robust to a smaller group of countries that includes the arguably bigger economies of Argentina, Brazil, Chile, Colombia, Mexico, and Peru.

4 The DSGE Model

This section describes a model consistent with the evidence in the previous section that sheds light on the role of fiscal policy and sectoral allocation on the evolution of the skill premium over the business cycle. The model is a perfectly competitive small open economy populated by high-skilled and low-skilled households who supply the labor input used by representative firms that produce a tradable and a nontradable good. The nontradable sector is relatively more intensive in low-skilled labor. The government taxes output at a constant rate and purchases goods according to a policy rule that can be pro or countercyclical.

4.1 Households

There are high-skilled and low-skilled representative households. Both types of households have access to the international financial market, where they can buy and sell one-period risk-free foreign bonds. In what follows, individual variables are in lower case; aggregate variables in upper case.

Households choose consumption and labor effort to maximize the expected present-discounted value of lifetime utility:

$$\underset{c_{i,t};n_{i,t}}{\text{Max}} \quad \mathbb{E}_t \sum_{j=0}^{\infty} \beta^j u^b_{t+j} v(c_{i,t+j}; n_{i,t+j}), \tag{1}$$

for $i = \{H, L\}$, where H refers to high-skilled households and L to low-skilled households. $c_{i,t}$ is a consumption bundle of tradable and nontradable goods, and $n_{i,t}$ is the number of hours worked by household i. β is the discount factor, and u^b_t is a preference shifter that is common across households and evolves according to an exogenous stochastic process:

$$\ln(u^b_t) = \rho_b \ln(u^b_{t-1}) + \epsilon^b_t, \tag{2}$$

where $\rho_b \in (-1, 1)$, and $\epsilon^b_t \sim$ i.i.d.$(0, \sigma^2_b)$ is a preference shock. A positive shock to ϵ^b_t induces households to be temporarily more impatient, which creates an incentive to increase consumption and reduce savings (or accumulate debt). I use this preference shock to drive an economic expansion in the model. This simple way of generating a positive demand disturbance can be interpreted as a reduced-form counterpart to a benign shock to the country interest rate premium, which has been found to be an important driver of business cycles in emerging countries, and Latin American ones in particular.[14]

I assume preferences are of the GHH form:[15]

$$v(c_{i,t}; n_{i,t}) = \frac{\left[c_{i,t} - \frac{1}{\omega}(n_{i,t})^{\omega}\right]^{1-\sigma}}{1-\sigma},$$

where $\sigma > 0$ is the coefficient of relative risk aversion, and $\omega > 1$ governs the wage elasticity of labor supply, given by $({}^1/_{\omega-1})$. The consumption aggregator $c_{i,t}$ is a constant elasticity of substitution (CES) function that includes tradable and nontradable goods, denoted $c^x_{i,t}$ and

[14]See, for example, Neumeyer and Perri (2005), Uribe and Yue (2006), and Fernández, González, and Rodríguez (2015).

[15]This preference specification is due to Greenwood, Hercowitz, and Huffman (1988).

$c^z_{i,t}$, respectively:

$$c_{i,t} = \left[\varphi^{\frac{1}{\chi}} \left(c^z_{i,t}\right)^{\frac{\chi-1}{\chi}} + (1-\varphi)^{\frac{1}{\chi}} \left(c^x_{i,t}\right)^{\frac{\chi-1}{\chi}}\right]^{\frac{\chi}{\chi-1}}. \tag{3}$$

The parameter $\varphi \in (0,1)$ governs the share of nontradables in the consumption basket (it is typically called a measure of "home bias"), and $\chi > 0$ is the constant elasticity of substitution between tradables and nontradables. The price of this basket is given by:

$$p_{i,t} = \left[\varphi \left(p_{z,t}\right)^{1-\chi} + (1-\varphi)\right]^{\frac{1}{1-\chi}}, \tag{4}$$

where $p_{z,t}$ is the relative price of the nontradable good. The tradable good is the numeraire, so its price is assumed to be equal to one and to obey the law of one price. The price index $p_{i,t}$, as well as the following demand schedules for tradable and nontradable goods, can be obtained by solving the problem of consumption maximization subject to a given level of expenditures:

$$c^z_{i,t} = \varphi \left(\frac{p_{z,t}}{p_{i,t}}\right)^{-\chi} c_{i,t}, \tag{5}$$

$$c^x_{i,t} = (1-\varphi) \left(\frac{1}{p_{i,t}}\right)^{-\chi} c_{i,t}. \tag{6}$$

In addition to purchasing tradable and nontradable goods, households receive a wage in exchange for labor services, are able to issue foreign one-period debt denominated in units of the tradable good, and pay lump-sum taxes. Therefore, the period-by-period budget constraint is given by:

$$p_{i,t}c_{i,t} + (1 + r_{i,t})d_{i,t} = w_{i,t}n_{i,t} + d_{i,t+1} - T_t, \tag{7}$$

where $d_{i,t}$ is the stock of foreign debt held by household i at the beginning of period t, which carries an interest rate $r_{i,t}$, $w_{i,t}$ is the real wage, and T_t denotes a lump-sum tax payment, which is constant across households.

To close the open economy, I assume the foreign interest rate is debt elastic:

$$r_{i,t} = r + \psi \cdot (e^{\tilde{d_{i,t}} - d_i} - 1), \tag{8}$$

where r is the world interest rate, $\psi > 0$ governs the intensity of the interest rate premium, $\tilde{d_{i,t}}$ is the cross-sectional average of debt among households of type i, which each household takes as exogenous, and d_i is its steady state level.[16]

Utility maximization results in standard optimality conditions:

$$(n_{i,t})^{\omega-1} = \frac{w_{i,t}}{p_{i,t}}, \tag{9}$$

$$\left[c_{i,t} - \frac{1}{\omega}(n_{i,t})^{\omega}\right]^{-\sigma} = \beta \mathbb{E}_t \left\{ \frac{u^b_{t+1}}{u^b_t} \left[c_{i,t+1} - \frac{1}{\omega}(n_{i,t+1})^{\omega}\right]^{-\sigma} \frac{p_{i,t}}{p_{i,t+1}}(1 + r_{i,t+1}) \right\}. \tag{10}$$

Equation (9) is a labor supply schedule. Importantly, GHH preferences imply that labor supply is solely a function of the real wage, and in particular, there are no wealth effects on labor supply. Equation (10) is the household's intertemporal optimality condition.

4.2 Aggregation

Consumption aggregates and total private foreign debt are given by the following expressions:

$$C_t = c_{H,t} + c_{L,t}, \tag{11}$$

$$C^z_t = c^z_{H,t} + c^z_{L,t}, \tag{12}$$

[16]A debt-elastic interest rate premium is one of several methods that ensure foreign debt is stationary. See Schmitt-Grohé and Uribe (2003).

$$C_t^x = c_{H,t}^x + c_{L,t}^x, \tag{13}$$

$$D_t = d_{H,t} + d_{L,t}. \tag{14}$$

4.3 Firms

Competitive representative firms in each sector choose high-skilled and low-skilled labor to maximize profits. Both firms produce output according to a constant returns to scale Cobb-Douglas technology. The government taxes income received by firms at a rate $\tau > 0$. Therefore, the tradable firm faces the following problem:

$$\underset{N_{H,t}^x;N_{L,t}^x}{\text{Max}} \quad \Pi_t^x = (1-\tau)Y_t^x - w_{H,t}N_{H,t}^x - w_{L,t}N_{L,t}^x, \tag{15}$$

$$Y_t^x = A^x \left(N_{H,t}^x\right)^{\alpha_x} \left(N_{L,t}^x\right)^{1-\alpha_x}, \tag{16}$$

where Y_t^x is tradable output, A^x is a time-invariant total factor productivity index, $N_{H,t}^x$ is the quantity of high-skilled hours employed in the tradable sector, $N_{L,t}^x$ is the quantity of low-skilled hours, and α_x is the output elasticity of high-skilled labor in the tradable sector.[17]

Similarly, the firm that produces the nontradable good faces the following problem:

$$\underset{N_{H,t}^z;N_{L,t}^z}{\text{Max}} \quad \Pi_t^z = (1-\tau)p_{z,t}Y_t^z - w_{H,t}N_{H,t}^z - w_{L,t}N_{L,t}^z, \tag{17}$$

$$Y_t^z = A^z \left(N_{H,t}^z\right)^{\alpha_z} \left(N_{L,t}^z\right)^{1-\alpha_z}. \tag{18}$$

[17] The Cobb-Douglas production function (16) implies that the elasticity of substitution between high- and low-skilled labor is equal to one. Duffy, Papageorgiou, and Perez-Sebastian (2004) offer estimates that range from 1.3 to 10 as a by-product of their empirical analysis of capital-skill complementarity in a panel of developed and developing countries.

Profit maximization by firms results in standard conditions for labor demand:

$$w_{H,t} = (1-\tau)\alpha_x \frac{Y_t^x}{N_{H,t}^x}, \tag{19}$$

$$w_{L,t} = (1-\tau)(1-\alpha_x) \frac{Y_t^x}{N_{L,t}^x}, \tag{20}$$

$$w_{H,t} = (1-\tau)\alpha_z p_{z,t} \frac{Y_t^z}{N_{H,t}^z}, \tag{21}$$

$$w_{L,t} = (1-\tau)(1-\alpha_z) p_{z,t} \frac{Y_t^z}{N_{L,t}^z}. \tag{22}$$

I assume that the nontradable sector is relatively more intensive in low-skilled labor, so that $\alpha_z < \alpha_x$. The assumption of a relatively high-skill-intensive tradable sector is somewhat related to the Dutch Disease literature, which often assumes the manufacturing tradable sector is "special" in the sense that it concentrates learning-by-doing, increasing returns to scale, spillover effects, or other positive externalities. See, for example, van Wijnbergen (1984), Lama and Medina (2012), and García-Cicco and Kawamura (2015).

4.4 Government

The government purchases tradable and nontradable goods, levies taxes on the income received by firms, collects lump-sum taxes from households, and issues one-period risk-free foreign bonds denominated in units of the tradable good. Therefore, the government's budget constraint is given by:

$$p_t^G G_t + (1+r) D_t^G = \tau (Y_t^x + p_{z,t} Y_t^z) + T_t + D_{t+1}^G. \tag{23}$$

G_t is a CES basket of tradable and nontradable goods purchased at price p_t^G, and D_t^G is the stock of public foreign debt at the beginning of period t, for which the government pays the world interest rate r.

Regarding government purchases, I assume the degree of home bias and the elasticity of substitution between goods are the same as those for private purchases, so that:

$$G_t = \left[\varphi^{\frac{1}{\chi}} \left(G_t^z\right)^{\frac{\chi-1}{\chi}} + (1-\varphi)^{\frac{1}{\chi}} \left(G_t^x\right)^{\frac{\chi-1}{\chi}}\right]^{\frac{\chi}{\chi-1}}. \tag{24}$$

The price index p_t^G and the demand schedules G_t^z and G_t^x can be obtained by solving the problem of maximizing purchases subject to a given level of expenditure:

$$p_t^G = \left[\varphi \left(p_{z,t}\right)^{1-\chi} + (1-\varphi)\right]^{\frac{1}{1-\chi}}, \tag{25}$$

$$G_t^z = \varphi \left(\frac{p_{z,t}}{p_t^G}\right)^{-\chi} G_t, \tag{26}$$

$$G_t^x = (1-\varphi) \left(\frac{1}{p_t^G}\right)^{-\chi} G_t. \tag{27}$$

The assumption that home bias in government purchases is the same as that for households is likely to be conservative for the purposes of this paper. The government demands, in reality, a substantial quantity of nontradable services for public administration and the construction and maintenance of infrastructure. A higher, more realistic share of nontradables in the government's CES basket would increase the ability of fiscal policy to amplify an expansion in the nontradable sector.

A fiscal policy rule consists of specifications for total government purchases and lump-sum taxes that satisfy the government's intertemporal budget constraint. Letting $Y_t \equiv Y_t^x + p_{z,t} Y_t^z$ denote gross domestic product (GDP) at time t, government purchases are a function of last period's *output gap*—the deviation of GDP from its steady state level $\bar{Y}$:

$$G_t = \bar{G} + \phi_G \cdot (Y_{t-1} - \bar{Y}), \tag{28}$$

where $\bar{G}$ denotes the steady-state level of purchases, and the parameter ϕ_G governs their response to the output gap $(Y_{t-1} - \bar{Y})$, and thus, the cyclicality of fiscal policy:[18]

$$\phi_G \begin{cases} > 0 & \text{procyclical} \\ = 0 & \text{acyclical} \\ < 0 & \text{countercyclical} \end{cases}$$

Lump-sum taxes adjust to stabilize public foreign debt around its steady state level $\bar{D^G}$:

$$T_t = \phi_T \cdot (D^G_{t-k} - \bar{D^G}), \tag{29}$$

where the parameter $\phi_T > 0$ determines the strength of the response, and k is the lag with which lump-sum taxes respond to deviations of debt from steady state.[19]

4.5 Market Clearing Conditions

High-skilled and low-skilled labor—the factors of production—are freely mobile across the tradable and nontradable sectors, so market clearing requires:

$$n_{H,t} = N^x_{H,t} + N^z_{H,t}, \tag{30}$$

$$n_{L,t} = N^x_{L,t} + N^z_{L,t}. \tag{31}$$

Nontradables cannot be exported or imported, so domestic demand must be satisfies by domestic supply:

$$Y^z_t = C^z_t + G^z_t. \tag{32}$$

Finally, the balance-of-payments identity holds for the small open economy:

[18] Lim and McNelis (2013) use a similar formulation for government purchases.

[19] Leeper, Walker, and Yang (2010) use similar debt-stabilization formulations for instruments such as transfers and tax rates.

$$\underbrace{-\left[\left(D_{t+1}^G - D_t^G\right) + (D_{t+1} - D_t)\right]}_{\text{capital account}} = \underbrace{\underbrace{\left[Y_t^x - (C_t^x + G_t^x)\right]}_{\text{trade balance}} \underbrace{-\left[r_{H,t} d_{H,t} + r_{L,t} d_{L,t} + r D_t^G\right]}_{\text{net interest income}}}_{\text{current account}}, \quad (33)$$

4.6 Equilibrium

The competitive rational expectations equilibrium of the model is a set of sequences

$$\{Y_t^z; Y_t^x; C_t; C_t^z; C_t^x; c_{H,t}; c_{L,t}; c_{H,t}^z; c_{H,t}^x; c_{L,t}^z; c_{L,t}^x; N_{H,t}^z; N_{H,t}^x; N_{L,t}^z; N_{L,t}^x;$$
$$n_{H,t}; n_{L,t}; G_t; G_t^z; G_t^x; T_t; D_t^G; d_{H,t}; d_{L,t}; r_{H,t}; r_{L,t}; p_{z,t}; p_{H,t}; p_{L,t}; p_t^G\}_{t=0}^{\infty},$$

such that the households' and firms' optimization problems are solved, and the markets for goods and factors of production clear, given the initial values $D_0^G, d_{H,0}, d_{L,0}$, and the exogenous sequence $\{u_t^b\}_{t=0}^{\infty}$. The technical appendix lists the system of expectational difference equations that describe the competitive equilibrium.

I solve the model by linear approximation, and specifically, by taking a first-order Taylor series expansion around the model's deterministic steady state.

5 Calibration

The model is calibrated to Argentina. A subset of parameters take values commonly found in the small open economy DSGE literature. I calibrate others so that the steady state of the model reproduces several features of Argentina's economy. The technical appendix offers details on the derivation of the steady state.

Table 1 summarizes the calibration. The unit of time is a quarter, so the world interest rate r is set to 1 percent and the discount factor $\beta = 0.99$. The coefficient of relative risk aversion $\sigma = 2$, as is common in the literature. Following Schmitt-Grohé and Uribe (2003),

Table 1: Calibration of DSGE Model

Symbol	Value		Description
Parameters			
r	0.01		World interest rate
β	0.99		Discount factor
σ	2		Coefficient of relative risk aversion
ψ	0.0007		Risk premium parameter
ω	3		Governs wage elasticity of labor supply
χ	0.44		Elasticity of subst. tradables and nontradables
φ	0.44		Share of nontradables in CES baskets
τ	0.13		Tax rate
ϕ_G	1.18		Reaction of government purchases to output gap
ϕ_T	0.2		Reaction of lump-sum taxes public debt
k	1		Lag in reaction of lump-sum taxes
ρ_b	0.8		Persistence of preference process
σ_b	0.1		Standard deviation of preference shock
α_x	0.88		Output elasticity of skilled labor (tradable)
α_z	0.23		Output elasticity of skilled labor (nontradable)
Restrictions			
S_G	0.13		Government spending-to-output ratio
S_{Dg}	0.30		Public foreign debt-to-output ratio
S_{tb}	0.025		Trade balance-to-output ratio
Targets	**Model**	**Data**	**Description**
$^{w_H}/_{w_L}$	1.30	1.29	Skill premium
Γ	19	19	% diff. in avg. wages between sectors

the parameter that governs the risk premium on foreign debt $\psi = 0.0007$; this small value ensures stationarity of the debt process without affecting the dynamics of the model. As in Pieschacón (2012), I set $\omega = 3$, which implies a wage elasticity of labor supply equal to 0.5. The elasticity of substitution between tradable and nontradable goods $\chi = 0.44$, as in Stockman and Tesar (1995). Total foreign debt at the steady state is set so that the trade balance-to-GDP ratio is 2.5 percent, the mean value from 1994 to 2013.

As for the parameters related to fiscal policy, I set the tax rate $\tau = 0.13$, so that in the steady-state, the ratio of government purchases to GDP is 0.13, and the ratio of public foreign debt to GDP is 0.30. These ratios are mean values for the period 1994–2013. Lump-sum taxes are zero in the steady state.

To calibrate ϕ_G, the parameter that governs the response of government purchases to the output gap, I regress total government spending on the output gap lagged one quarter, plus a constant:[20]

$$G_t = -0.0022 + 1.1856 \cdot Y_{t-1} + \epsilon_t, \tag{34}$$

where $\hat{\phi_G} = 1.1856$ is significant at the 99 percent confidence level. (The adjusted $R^2 = 0.30$.)

I set ϕ_T, the parameter that governs the reaction of lump-sum taxes to public debt, equal to 0.2, and assume lump-sum taxes react with a 1-quarter lag ($k = 1$) to deviations of public debt from steady state, but the results are not sensitive to this parameter; they are virtually identical under the assumption of an 8-quarter lag in the response of lump-sum taxes.

The stochastic process followed by the preference shifter is fairly persistent, with $\rho_b = 0.8$, so that a one-time shock lasts for about two and a half years. The standard deviation $\sigma_b = 0.10$, roughly a 10 percent increase in the discount factor, so that a shock of this size generates an increase in aggregate private consumption of about 3 percent on impact.

Finally, I calibrate the output elasticities of skilled labor in each sector, α_x and α_z, through an iterative procedure. These parameters take values from a grid until the skill premium in the steady state $({}^{w_H}/_{w_L})$ converges to a value close to 1.29, and the difference in average wages between the tradable and nontradable sectors (which I denote Γ) converges to 19 percent. The target for the skill premium ${}^{w_H}/_{w_L} = 1.29$ is the mean ratio of hourly wages of medium-skilled to low-skilled workers over the period 2003:2–2013:1, taken from SEDLAC.[21] The dynamics of the model are robust to using the wage ratios of high- to low-skilled workers, or high- to medium-skilled workers as targets for the steady-state skill premium.

Γ, the percent difference in average wages between the tradable and nontradable sectors,

[20]Regression results are based on quarterly data for the period 2000:1–2012:4. I remove an HP trend from deflated and seasonally adjusted data.

[21]In SEDLAC, medium-skilled workers are those with 9 to 12 years of formal education, whereas low-skilled workers are those with 0 to 8 years of formal education.

is an important target because it proxies the skill intensity of the tradable sector relative to the nontradable sector. The assumption of free labor mobility across sectors implies that differences in average wages are only due to differences in skill intensities. Let w^x and w^z denote average wages in the tradable and nontradable sectors, respectively, in the steady state. These are themselves a weighted average of wages earned by high- and low-skilled workers in each sector:

$$w^j = \left(\frac{N_H^j}{N_H^j + N_L^j}\right) w_H + \left(\frac{N_L^j}{N_H^j + N_L^j}\right) w_L, \tag{35}$$

for $j = \{x, z\}$. Since high- and low-skilled wages are constant across sectors, w^x and w^z will differ only if skill intensities—the weights in parentheses—differ. Let $\Gamma \equiv (w^x - w^z)/w^z * 100$, the percent difference between tradable and nontradable wages. A positive value for Γ implies the tradable sector is relatively more intensive in high-skilled labor. To construct Γ, I compute w^x as the average wage in manufacturing, and w^z as the average wage in low-skill services, as defined in section 3, weighted by the share of employment in each sector.[22]

6 Analysis of the Model Economy

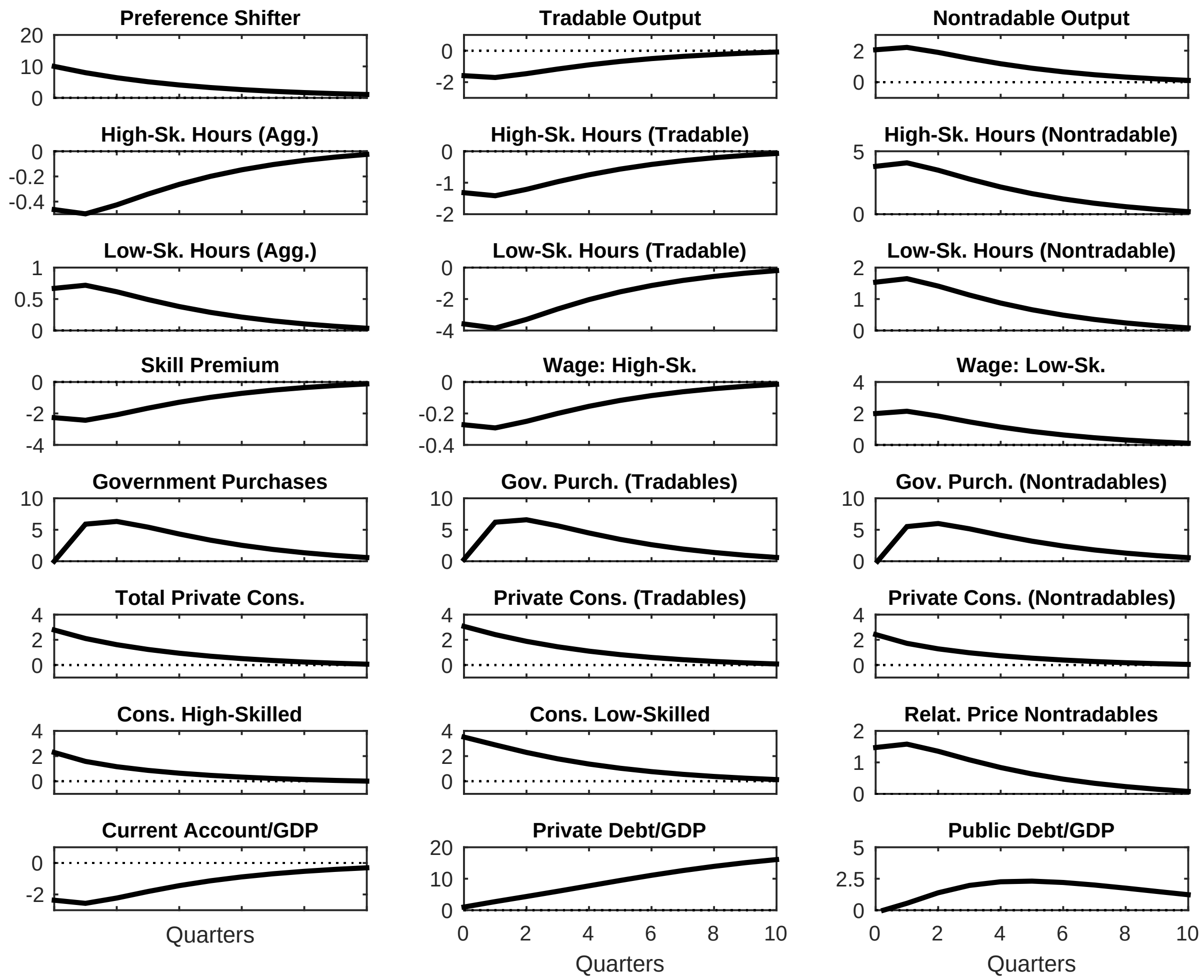
What is the effect of an expansionary demand shock on the model economy, and especially on the skill premium? Figure 8 shows the dynamic effects of a one-standard-deviation shock to the preference shifter. In what follows, I explain why the expansionary shock generates a decline in the skill premium, and then study and quantify the exacerbating effect of procyclical fiscal policy.

6.1 Effects of an Expansionary Demand Shock

The positive preference shock turns households more impatient, which induces an increase in consumption of tradable and nontradable goods by high-skilled and low-skilled households

[22]Data on employment shares also come from SEDLAC.

Figure 8: Impulse Responses to a Preference Shock



Impulse responses to a 10 percent preference shock. Vertical axes show percent deviations from the steady state, except for the current account, and private and public debt, which are ratios to GDP.

(sixth and seventh rows of figure 8). Nontradable goods must be produced domestically, whereas tradables can be imported, so the increase in demand leads to an increase in the relative price of nontradables (a real exchange rate appreciation) and a drastic reallocation of high-skilled and low-skilled labor from the tradable to the nontradable sector (second and third rows). This reallocation results in an expansion of nontradable output, a contraction of tradable output (first row), and a deterioration of the current account-to-GDP ratio, which is financed by an increase in foreign debt (last row). Government purchases are procyclical in Argentina, so the expansionary shock leads to expansionary fiscal policy (fifth row).

The reallocation induces a decline in the skill premium, since the wage earned by high-skilled workers decreases while the wage earned by low-skilled workers increases (fourth row). What is the intuition behind the fall in the skill premium? In a nutshell, the increase in demand for low-skilled labor relative to high-skilled labor triggered by the reallocation to the low-skill-intensive nontradable sector bids the low-skilled wage up and compresses the premium. To provide intuition, figure 9 sketches the static effects of the shock on the markets for high-skilled and low-skilled labor. Due to GHH preferences, labor supply depends only on the real wage, so equilibrium changes are the result of shifts in labor demand. The nontradable firm demands more of both high-skilled and low-skilled labor, taking wages as given. Conversely, the tradable firm demands less of both inputs. In the market for high-skilled labor (left panel of figure 9), demand by the nontradable firm increases, whereas demand by the tradable firm decreases. But the tradable sector is more intensive in high-skilled labor, so the overall effect is a decline in aggregate demand for high-skilled labor, pushing the equilibrium wage and hours worked down.

In the market for low-skilled labor (right panel of figure 9), demand by the nontradable firm increases, whereas demand by the tradable firm decreases. But since the nontradable sector is more intensive in low-skilled labor, the overall effect is an increase in aggregate demand, which pushes the equilibrium wage and hours worked up.

The developments in both labor markets lead to a decline in the skill premium $\frac{w_H}{w_L}$. Since

Figure 9: Markets for High-Skilled and Low-Skilled Labor

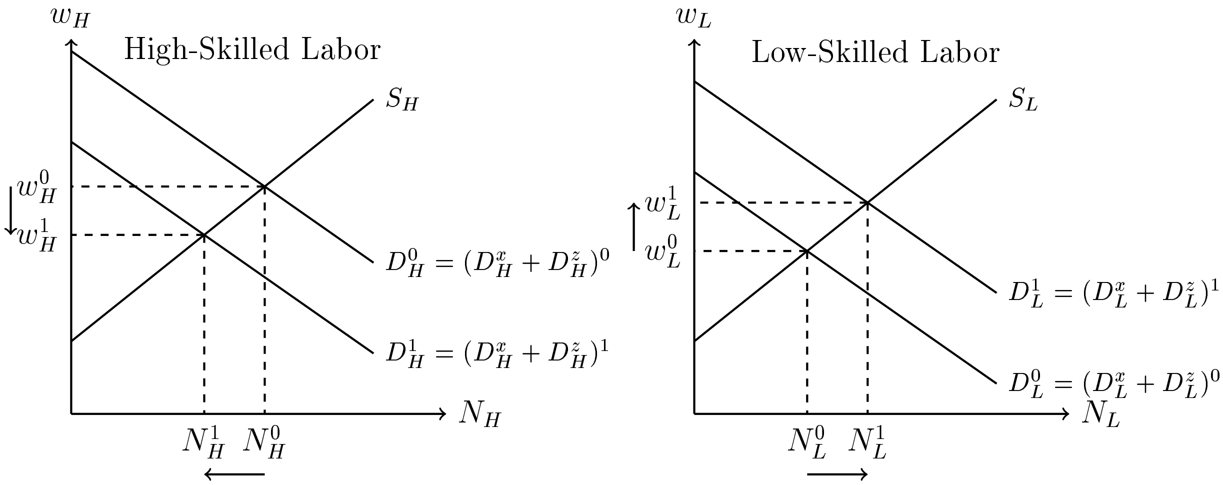
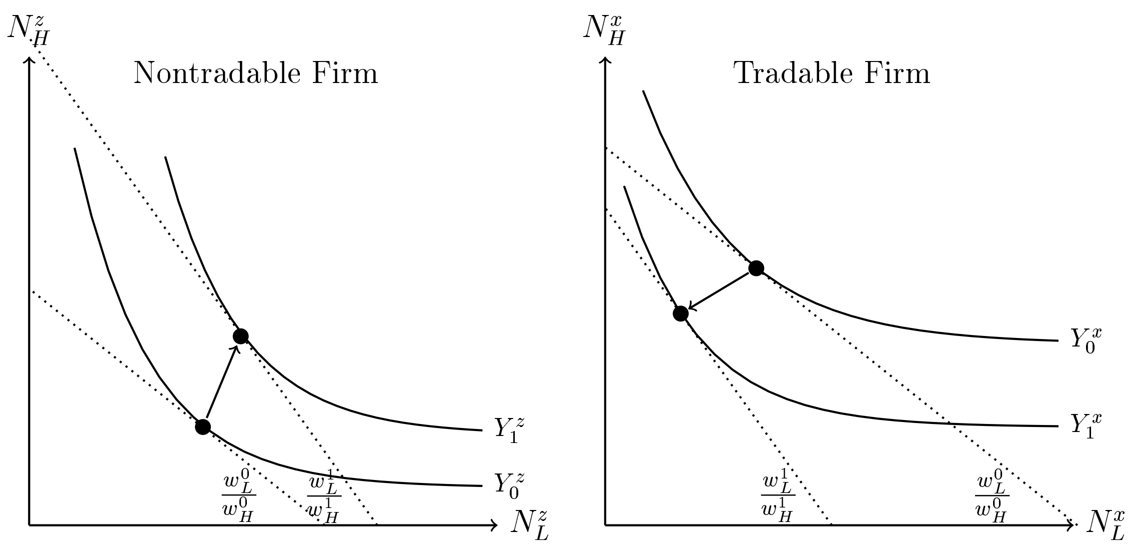


Figure 10: Optimal Choice of Inputs



the premium is the relative price of high-skilled labor, both firms respond by increasing their ratio of high- to low-skilled labor. This narrative is illustrated in figure 10, which sketches isoquant and isocost curves for the tradable and nontradable firms.

6.2 The Role of Procyclical Fiscal Policy

I now study the role of procyclical fiscal policy in the declining skill premium. In particular, I use the DSGE model to explore counterfactual scenarios under which Argentine fiscal policy is acyclical and countercyclical. Under an acyclical policy, government purchases do not respond to the output gap, so for this scenario the reaction coefficient ϕ_G in equation (28) takes a value of 0. As for the scenario of a countercyclical policy, I assign ϕ_G a value that corresponds to the reaction of *Chilean* government purchases to the output gap. Chile's fiscal framework, centered on a *structural* budget balance rule that allows it to avoid fiscal procyclicality, is widely considered a feature of sound macroeconomic policy.[23] A regression of government spending on GDP, analogous to the one described by equation (34) for Argentina, results in the following fiscal policy reaction function estimate for Chile:

$$G_t = -0.0006 - 1.0447 \cdot Y_{t-1} + \epsilon_t,$$

where $\hat{\phi_G} = -1.0447$ is significant at the 99 percent confidence level. (The adjusted $R^2 =$ 0.26.)

Figure 11 shows the dynamic effects of a one-standard-deviation preference shock under alternative cyclical stances of fiscal policy. Solid black lines reproduce the baseline case of a procyclical policy, dashed red lines denote responses under an acyclical policy, and dash-and-dotted blue lines correspond to a countercyclical fiscal policy. As the fourth row shows, changes in the skill premium are inversely related to the cyclical response of fiscal policy: the premium declines less than in the baseline case when policy is acyclical, and even less when policy is countercyclical as in Chile. Why does procyclical fiscal policy exacerbate the effect of the shock on the skill premium, whereas countercyclical policy dampens it? The answer is simple. The government receives more tax revenue as a result of the economic expansion. Under a procyclical rule, it responds by demanding more tradable and nontradable goods, which exacerbates the reallocation from the tradable to the nontradable sector, i.e., the increase in demand for low-skilled labor accompanied by a decrease in demand for high-skilled labor. The result is a larger drop in the skill premium. A countercyclical policy, on the other hand, dampens the economic expansion, since the government reduces its purchases

[23] See, for example, Medina and Soto (2007), Frankel (2011), and Kumhof and Laxton (2009).

Table 2: Cumulative Responses to Preference Shock Under Alternative Fiscal Policy Rules

	(a) Skill Premium			(b) Government Purchases		
Qrt.	Baseline	Acyclical	Countercyc.	Baseline	Acyclical	Countercyc.
$t = 0$	-2.3	-2.3	-2.3	0.0	0.0	0.0
$t = 2$	-6.8	-5.5	-4.6	12.2	0.0	-8.2
$t = 5$	-10.7	-8.0	-6.6	25.3	0.0	-14.1
$t = 10$	-12.6	-9.3	-7.6	32.6	0.0	-17.3
	(c) Nontradable Output			(d) Tradable Output		
Qrt.	Baseline	Acyclical	Countercyc.	Baseline	Acyclical	Countercyc.
$t = 0$	2.1	2.1	2.1	-1.6	-1.6	-1.6
$t = 2$	6.2	5.0	4.2	-4.8	-3.9	-3.3
$t = 5$	9.7	7.3	6.0	-7.5	-5.6	-4.6
$t = 10$	11.5	8.5	6.9	-8.9	-6.5	-5.3

Cumulative impulse responses to a one-standard-deviation preference shock at horizon t. Percent deviations from steady state.

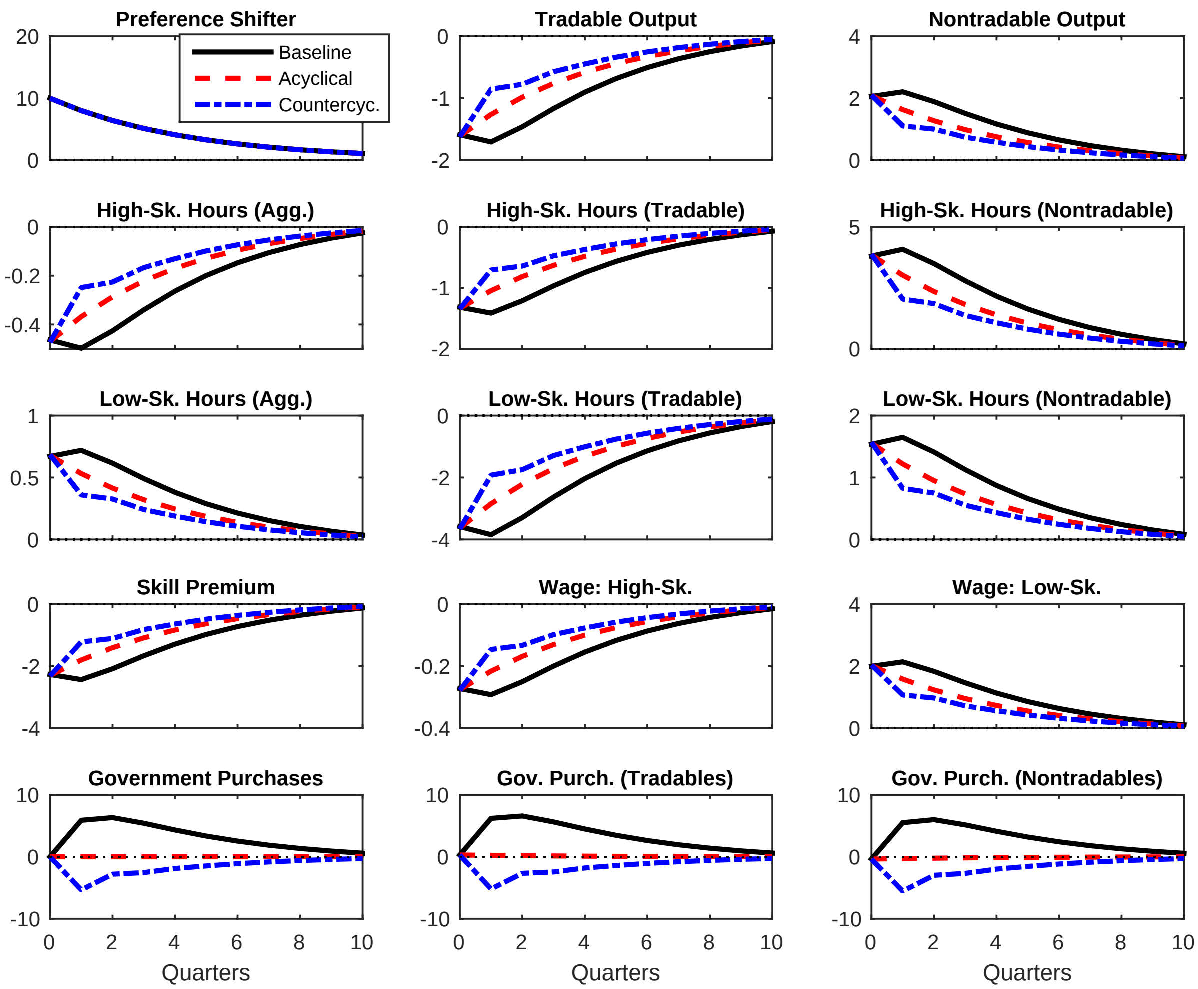
of tradable and nontradable goods, mitigating sectoral reallocation and the decline in the skill premium.

The results in figure 11 are consistent with the empirical evidence on the inverse relation between fiscal procyclicality and income inequality presented in section 3.

Table 2 quantifies the role fiscal policy plays in the propagation of the shock. It reports cumulative impulse responses of four key variables at different horizons under the three alternative policies. The variables included in the table are the skill premium, government purchases, tradable output, and nontradable output. Government purchases respond with a lag, so the effects of the shock on impact ($t = 0$) are independent of fiscal policy. But as quarters go by, the effects become substantial. As panel (a) shows, 10 quarters after the shock hits the economy, the skill premium has fallen by a cumulative 12.6 percent below its steady state under the baseline procyclical policy, but only 9.3 percent and 7.6 percent under the acyclical and countercyclical policies, respectively. In other words, if Argentine fiscal policy responded as its Chilean counterpart, the cumulative effect of the shock on the skill premium would be 40 percent smaller.[24]

[24] $(1 - 7.6/12.6) * 100 = 40$.

Figure 11: Effects of a Preference Shock under Alternative Fiscal Policy Rules



Impulse responses to a 10 percent preference shock. Solid black lines reproduce responses under the baseline value of $\phi_G = 1.18$. Dashed red lines show responses under an acyclical fiscal policy rule ($\phi_G = 0$). Dash-and-dotted blue lines show responses under a countercyclical rule ($\phi_G = -1.05$) calibrated to match fiscal policy in Chile. Vertical axes show percent deviations from the steady state, except for the current account, and private and public debt, which are ratios to GDP.

Panels (c) and (d) of table 2 show the substantial amplifying effect of fiscal policy on sectoral allocation. Under the baseline procyclical policy, nontradable output expands 11.5 percent over a 10-quarter horizon, but only 6.9 percent under a fiscal response in the style of Chile's. Tradable output contracts 8.9 percent under Argentina's procyclical response, but only 5.3 percent under the countercyclical fiscal rule. In sum, the countercyclical policy dampens the effect of the shock on sectoral allocation by 40 percent relative to the procyclical policy.

7 Conclusion

Income inequality declined substantially within most Latin American countries during the 2000s. This paper argues that at least part of this decline is a cyclical phenomenon: the 2000s were characterized by an economic expansion during which most countries implemented a procyclical fiscal policy. A small open economy dynamic stochastic general equilibrium (DSGE) model shows that a procyclical policy contributes to a decline in the skill premium—the key driver of the decline in Latin American inequality—by exacerbating a boom concentrated on nontradable sectors that are intensive in low-skilled labor.

I document that, consistently with this framework, Latin America's boom was concentrated on nontradable sectors such as construction, wholesale and retail trade, restaurants, and transport, while manufacturing trailed behind. I also show the region experienced a real exchange rate appreciation during the 2000s. Furthermore, I document an inverse relation between fiscal procyclicality and income inequality among countries in the region.

The DSGE model used to rationalize this evidence is admittedly simple. High-skilled and low-skilled labor are freely mobile across the tradable and nontradable sectors. It would be useful to study a more realistic model in which high-skilled labor receives a wage premium but is less mobile than low-skilled labor. It would also be useful to model a more realistic economic expansion, appealing to shocks to commodity prices, interest rates, export demand, or the terms of trade, rather than preference shocks.[25] Finally, a framework able to relate the effects of cyclical phenomena and the stance of fiscal policy to the *accumulation of skills*, which is absent in this paper, could discriminate between demand and supply forces behind the cyclical variation in the skill premium.

[25]There are several papers on the drivers of business cycles in emerging economies that could inform the choice of shocks. See, for example, Fernández, González, and Rodríguez (2015), Mendoza (1995), Kose (2002), Neumeyer and Perri (2005), Osterholm and Zettelmeyer (2008), and Izquierdo, Romero, and Talvi (2008).

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