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Distortions, infrastructure, and female labor supply in developing countries

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ABSTRACT

In this paper I document cross-country gaps between gross domestic product (GDP) per capita and GDP per worker. The gaps are driven mostly by a lower female labor force participation (LFP) in developing countries. Females began to participate more in the labor markets of these countries when more households acquired access to basic infrastructure and when distortive policies affecting the prices of household appliances were partially removed. I use a model of home production with endogenous labor force participation to account for these facts. I find that the prices of household appliances and access to infrastructure are quantitatively important in explaining cross-country labor supply differences.

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1. Introduction

The existing literature on development has focused on analyzing cross-country differences in output per worker. The consensus is that almost 50% of these differences are accounted for by total factor productivity (TFP) differences (see Hall and Jones, 1999; Caselli and Growth, 2005, and, for Latin American (LA, henceforth) countries, Restuccia, 2008). However, cross-country gaps between gross domestic product (GDP) per capita and GDP per worker, driven by differences in labor force participation (LFP) across countries, have not garnered much attention in existing work. In this paper I document that the gap between GDP per worker and GDP per capita is entirely driven by differences in female LFP.

I uncover a new mechanism through which female LFP and economic development are intimately related. Moreover, I analyze the effect of economic reforms and government infrastructure programs on female LFP. Specifically, infrastructure refers to electricity and running water and the lack of access to it combined with low income and relatively expensive household appliances, prevent households in developing countries from adopting time-saving household technologies and, thus, from participating in the surging rate of technological progress in the home durable goods sector in the developed world.

I focus on a set of LA countries due to the availability of rich micro-data for a period of reforms and high income growth. In my empirical analysis, I narrow my focus specifically to Brazil and Mexico, the largest countries in the sample. Three novel

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aspects of the data motivate this study. First, LFP participation differences are due mainly to differences in the participation of women in the labor market. In the US, the female LFP rate was 69% by 1990, whereas in Brazil and Mexico it was 39% and 37%, respectively. More importantly, by performing an accounting exercise I find that differences in female LFP account for around 15% of the differences in GDP per capita between the LA countries and the US in the period 1980–1990. This observed gap in female LFP started to decrease in the early 1990s: in 2005, female LFP was 72% in the US and 66% and 48% in Brazil and Mexico, respectively. Interestingly, in the same period the survey data show substantial differences in the use of durable household goods across countries. For instance, 80% of US households used a washing machine in 1990, whereas in Brazil and Mexico only 24% and 36% of households used one, respectively.

Second, in almost all the LA countries in my sample the relative price of appliances was constant or increased until the beginning of the 1990s and then rapidly decreased in the period 1990–2005. LA countries constitute excellent laboratories to analyze the effects of changes in trade policy as import substitution policies were applied in these countries until the mid-1980s. The collapse of these economies sets the stage for trade reforms, and LA countries have drastically reduced their tariff and nontariff restrictions since the end of the 1980s. I provide data on the evolution of average tariff rates in this period that suggest a factual link between the evolution of these prices and the changes in the trade policy.

Third, I document substantial differences in the access to electricity and running water both across countries and within countries in the period analyzed. Almost all US households had access to running water (c. 1990), whereas in Brazil and Mexico only 78% and 81% of the households had access to this service, respectively.[1] Interestingly, most of the difference in access comes from poor households: in 1990, 97% and 92% of the households in the top-income quintile had access to these two services in Brazil and Mexico, but only 35% and 47% of the households in the bottom-income quintile had access to these infrastructure services, respectively. This unequal access to basic infrastructure dramatically changed in the post-reform period: between 1990 and 2005 access to electricity and running water for the bottom-income quintile increased by 94% and 53% in Brazil and Mexico, respectively.

According to this evidence, the relatively high prices of household appliances and the lack of access to infrastructure can be interpreted as barriers to technology adoption by LA households. These barriers were in place until approximately 1990 and then partially removed by 2005 after economic reforms were introduced in these countries. To analyze the impact of these reforms on the observed differences and evolution of the female LFP, in the second part of the paper I develop a quantitative model. Specifically, it is an overlapping-generations model with home production and endogenous LFP that builds on Greenwood et al. (2005) (GSY, henceforth) and incorporates these salient features of the data. Its key features are (i) heterogeneity in households' ability levels and (ii) access to the infrastructure needed to operate household durable goods. More critically, I specifically model the interplay between this type of heterogeneity and access to infrastructure services in determining the adoption of time-saving household technologies.

I then calibrate the model to the US and compute the steady-state predictions for each of the countries in my sample at two points in time: the pre-reform period (1990) and the post-reform period (2005). Using the calibrated model and data, I vary country-specific parameters to investigate how much of the observed differences in female LFP is accounted for by the model in both 1990 and 2005 for each of the countries considered. Specifically, I allow average human capital levels, household income inequality, access to basic infrastructure by income quintile, gender earnings gap, TFP, and the relative price of household appliances to be country specific.

For Brazil in its pre-reform (1990), I find that the model performs well in matching the observed level of female LFP (41% in the model versus 38% in the data). Furthermore, it also succeeds in predicting the observed female LFP in the post-reform period (70% in the model versus 66% in the data). Consequently, the model predicts a 78% increase in the female LFP (74% in the data). I also use the model for Mexico. In this case, I find that the model over predicts the levels of female LFP in both periods. However, it predicts a 15% increase in female LFP between these two periods, accounting for 50% of the increase observed in the data.

Finally, I conduct a counterfactual experiment in which I keep both the access to infrastructure and the change in the price of appliances in both Brazil and Mexico at their 1990 levels. This experiment can be viewed as a "policy" exercise since by eliminating the changes in these two variables, I am assessing the effect of the documented changes of trade policy and government infrastructure programs that took occurred in the study period. In these counterfactual economies the model accounts for just 7% of the observed increase in female LFP in Brazil and does not predict any change in female LFP in Mexico. Thus, access to infrastructure and the reduction in prices of household appliances are the main forces behind the observed increase in female LFP in these countries.

Related literature: Many authors (e.g. Prescott, 2004 and Rogerson, 2009, among others) have studied differences in the labor supply between developed countries, mostly between Europe and the US. Motivated by the fact that around 15% of the observed differences in GDP per capita between LA countries and the US is due to differences in LFP, I focus on the extensive margin of labor supply differences in the developing world.

In addition, most of the LFP differences are due to differences in the market work of females, and their connection with economic development has not received much attention in the macroeconomics literature. Specifically, two important aspects of my paper connect it with the development literature. The first is the analysis of the effect of the access to basic infrastructure, which has been a major concern for government policies aimed to measure the returns to public investment

[1] I use c. 1990 as a reference year because the Brazilian data are for year 1992, and Mexican data are for year 1989. Hereafter I use "1990" for simplicity.

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