ARGENTINA

SELECTED ISSUES

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ARGENTINA

SELECTED ISSUES

December 1, 2017

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CONTENTS

HOW TO REDUCE ARGENTINA'S TAX WEDGE[1]

A. Introduction

1.   Argentina's average tax wedge is the highest in Latin America and is comparable to that of OECD countries (IADB-OECD, 2016[2]). A high tax wedge (that is, the difference between the total cost of labor for the employer and the take-home labor income for the employee, after tax and cash benefits) may reduce labor demand, hinders firms' competitiveness, and act as a disincentive towards establishing formal labor market relations, particularly for low-skilled workers. Reducing the tax wedge is a policy priority to increase employment, support Argentina's competitiveness, and increase formality in the labor market.

2.   However, Argentina does not have the fiscal space to cut the tax wedge for all workers. Revenue from the Personal Income Taxes (PIT) and Social Security Contributions (SSCs), the major components of the tax wedge, amount to about 2.6 and 7 percent of GDP respectively.[3] Simply cutting SSC and PIT rates across the board would generate a revenue loss that Argentina cannot afford, given the priority to reduce its high fiscal deficit and lack of sustainability of its pension system, unless other taxes are raised or cuts in government spending implemented. As discussed in the Staff Report, while there is ample room to rationalize government spending, the space for increasing other taxes (such as VAT) is small, given Argentina's burdensome and distortionary tax system.

3.   Against this background, this paper discusses whether there is a more efficient way of taxing labor that has a minimal cost in terms of foregone revenues. We address the following questions:

- What are the major distortions associated to the way labor is taxed in Argentina?

- How can labor taxation be changed to make it less distortionary and reduce the tax wedge, if not for all, at least for most workers?

- How much would such a change cost, both directly and after considering the effect on employment and economic activity? What would be the social impact of the reform?

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[1] Prepared by Paolo Dudine, Ricardo Fenochietto, and Vivian Malta. Marina Mendes Tavares contributed to the analysis in section E.

[2] OECD tax wedge estimates for Latin America and the Caribbean are based on 2013 data. Between 2013 and 2016, only five countries (Costa Rica, Honduras, Mexico, Nicaragua, and Perú) introduced changes that would increase somewhat their tax wedge, but these would not change the top ranking.

[3] Technically, Social Security Contributions to the pension system are a form of saving. However, in Argentina most workers cannot accumulate enough contributions to become eligible to a contributory pension. For them, SSCs are a tax (see SIP "Reducing Informality in Argentina"), and so we will treat SSCs in this analysis.

4.   We discuss key features of Argentina's system of labor taxation and simulate the impact of a possible change on the tax wedge and the macro economy. Applying (with some simplifications) Argentina's tax code and transfers system to individuals in the Household Survey (EPH, *Encuesta Permanente de Hogares*), we estimate several measures of the tax burden on labor (including the tax wedge) and the *net cost of formalization* (that is, the amount of taxes that informal workers would need to pay, net of benefits, if they were to become formal) across the wage distribution, for all individuals in the survey, and for a few typical categories of households. We calibrate a simple model of optimal labor taxation (Brewer, Saez, and Shephard, 2010) to identify a few changes to Argentina's tax system that could reduce its distortions, while minimizing revenue losses. Finally, we use a dynamic general equilibrium model with heterogeneous agents to simulate the effects of the proposed changes on output, labor, and income inequality.

5.   Our main conclusion is that a significant reduction of the SSC combined with an expansion of the PIT base at the top of the income distribution would i) reduce the tax wedge with a minimum fiscal cost, and ii) boost formal employment and output. We simulate the effect of a package that cuts SSCs for both the employer and the employee to 10 percent (excluding contributions for health coverage while working, or *obras sociales*), combined with extending the coverage of the PIT to the top 20 percent of the wage distribution (from the current 10 percent), and redistribution of cash transfers toward the bottom decile of the wage distribution. The aggregate tax wedge would decline by about 9 percentage points on average, and by 20 percentage points for individuals with wages in the first decile of the wage distributions, with a total direct fiscal cost of 0.3 percent of GDP, or 0.1 once second round effects on economic activity are account for. Formal labor supply would increase 3.4 percent and the level of GDP by 1.2 percent in the long run, with no adverse impact on inequality.

B.   Taxation of Labor in Argentina

6.   Social security contributions for dependent workers are generally high in Argentina, despite the plethora of different regimes and exceptions. In particular:

- *Employees* contribute 14 percent of their gross salary for pension and health coverage when in retirement, and an additional 3 percent for health coverage while working (*obras sociales*), a higher rate compared to the rest of Latin America (about 9 percent on average, IADB- OECD, 2016).[4] Contributions cannot exceed a certain amount, nor can they be lower than a minimum, including for part time workers or for wages below the minimum.[5] Thus, the contribution rate can effectively exceed 17 percent at the bottom of the wage distribution.

- *Employers* contribute 17 percent of the gross salary (which increases to 21 percent for firms in the service and commerce sector) for retirement benefits and family allowances; and 6 percent

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[4] All wages are also subjected to union fees, irrespective of whether the worker is unionized or not.

[5] This reflects the existence of a minimum and a maximum for pension benefits.

of the gross salary for the employee's health coverage while working (*obras sociales*). This compares to about 17 percent, on average, in the rest of Latin America (IADB OECD, 2016).[6] Employers' contribution cannot be lower than a minimum amount (as for employees) but there is no cap. There are discounts for small firms (50 or 25 percent, depending on whether the employee works half, of full time) and there are also incentives to hire new employees (amounting to either 25 or 50 percent of the employer's contribution, depending on the firm size). Finally, in 2001, discounts were introduced that reduce the employer's contribution rate by a minimum of 0.85 percent, and up to 11.8 percent, depending on the location of the firm (with greater discounts applied to firms in more remote, low-population density areas).

7. **Only the top 10 percent of the income distribution pays income taxes.** The PIT is levied on labor income net of SSCs, after deductions for i) non-taxable income, ii) the so called "special deductions" (an extension of the deduction for non-taxable income), iii) family dependents, and iv) a few eligible expenses (for example, rent, interest on mortgages, medical expenses, etc.). The tax is levied based on a schedule of 9 marginal rates, from a minimum of 5 percent to a maximum of 35 percent after the reform implemented in 2016.[7] The reform effectively raised the minimum non-taxable income to about 1.5 times the estimated average wage of formal workers (see Annex I for details on this estimate), one of the highest exempt income level in Latin America and higher than any OECD country (Chart). However, once all deductions are factored in, labor income begins to be taxed only if it exceeds a level that can go up to twice the estimated average annual wage of formal workers (for a single earner couple with two children). As a result, only about 10 percent of formal sector workers are subject to the PIT, and revenues from PIT (at about 2.8 percent of GDP) are 2.7 times smaller than revenues from SSC (Chart).

Ratio of minimum taxable income to average wage
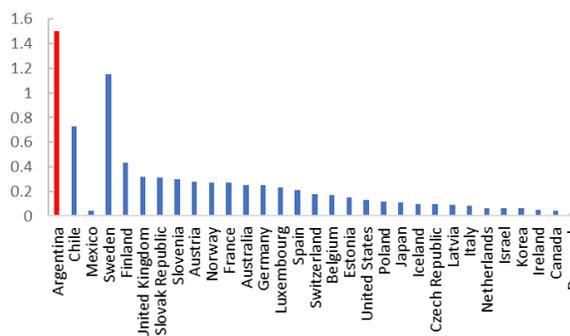
Source: MECON, based on OECD (Taxing Wages 2015) and SIPA, and staff calculations based on EPH.

Composition of Federal Taxes
(in percent of GDP)

■ PIT ■ CIT ■ SSC ■ VAT ■ Other
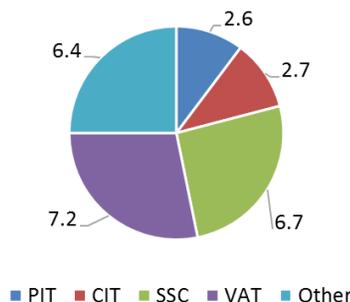
Source: MECON, and OECD.

8. **A special tax regime applies to labor income of the self-employed.** Self-employed (*autonomos*) contribute to the social security system paying a fixed amount that depends on the size

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[6] Employers are also obligated to obtain private insurance against work-related incidents that employee could suffer. Owing to data limitations we excluded this cost from all calculations in this paper.

[7] The end-2016 PIT reform increased the number of brackets and rates (from 7 to 9), decreased the lowest marginal tax rates (from 9 to 5 percent), eliminated some deductions and increased others (bringing them in line with 2009 levels in real terms), and exempted from the tax the difference between regular hourly wage and the wage for working extra-time.

and type of their activity, but only up to about half the maximum paid by dependent workers. Business owners and self-employed with gross revenue below a certain threshold (*monotributistas*) or that are economically vulnerable (*monotributistas sociales*), and domestic employees are subjected to a simplified system that unifies both SSCs and PIT (and the VAT) under one single tax.

9.   Child allowances are the main form of cash transfers to formal workers All formal workers, *monotributistas*, and domestic employees are eligible to receive allowances for under-age dependent children (since conception) and for a few life events (for example, marriage, birth, marriage, adoption).[8] Starting at about 5 percent of the estimated average wage, the child allowance is gradually phased out and completely eliminated when the gross wage of one of the parents exceeds twice the estimated average wage (about the 7th decile of the wage distribution). Unemployed informal sector workers, *monotributistas sociales*, and domestic employees are eligible to receive a child allowance (AUH, *Asignacion Universal por Hijo*), if their income is below the minimum wage, for an amount that is close to the child allowance received by low-wage formal dependent workers

10.   This system implies a high and flat tax rate on labor income and a tax wedge which is high on average but quite variable across households, regions, and sectors of the economy. Applying Argentina's tax and transfer systems (with some simplifications) to individuals in the Household Survey (see Annex 1 for details) we estimate a series of tax rates for all formal employees and for few selected types of households (single, single-earner couples, and first and second earners in two-earner couples, with and without children). The results show that:

- *Labor taxation is far from progressive.* The average tax rate on labor income (inclusive of both SSCs and PIT) is quite high at the bottom of the income distribution, and after falling for the middle-income workers begins steepening again at the very top of the distribution (Chart).

Taxes on Gross Wage (inclusive of all SSCs, and PIT)
(Percent of gross wage)
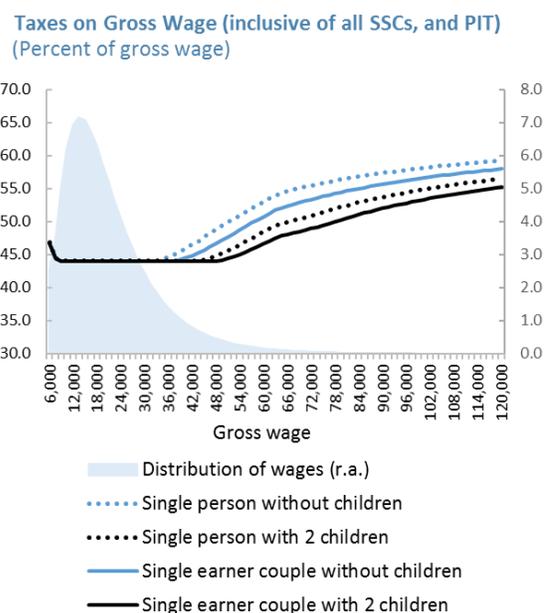
Source: Staff estimates based on EPH and tax code.

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[8] Retirees are also eligible to receive a spouse allowance. Child allowances are higher for children with disabilities.

Table 1. Argentina: Tax Wedge for Formal Employees
(percent of total cost to the employer)

	All family types	Single	First earners in single-earner couple	First earner in two-earner couple	Second earner in two-earner couple
Total	**27.1**	**29.0**	**24.3**	**24.0**	**31.9**
Without Children	33.6	33.4	33.6	33.3	34.0
With Children	22.8	19.3	21.0	19.0	30.9
Bottom 10 percent 1/	21.3	25.3	16.3	17.6	28.5
Upper 20 percent 1/	34.1	34.6	33.3	32.8	34.9

Source: Staff estimates based on tax code and Household Survey

1/ Distribution of gross wages of formal employees

- *The tax wedge is high for most workers.* The average tax wedge across all formal employees is 27.1 percent (Table 1). However, the average masks significant variation across types of households, as the average tax wedge can be as low as 19 percent for singles or single-earner households with children, and as high as 34 percent for the second earner in a couple without children. Looking at the distribution of the tax wedges across the wage distribution shows that child allowances significantly reduce the burden of taxation on labor income. At lower wages, the difference in the tax wedge between a household with and without children can be as high as 25 percent (Chart and Table 1).

Tax wedge
(Percent of total cost to the employer)

Distribution of gross wages (r.a.)
······· Single person without children
······· Single person with 2 children
—— Single earner couple without children
—— Single earner couple with 2 children
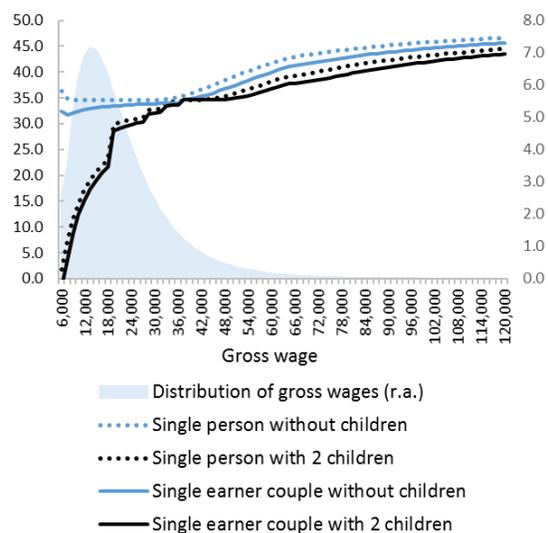
Source: Staff estimates based on tax code, and Household Survery.

- *There is a large dispersion of tax wedges across regions and sectors.* Owing to reduced SSC rates by sector and region, the average tax wedge can be as low as 19 percent in the private education sector, or as high as almost 40 percent for commerce, a sector that accounts for about 19 percent of total formal employment. While this dispersion complicates tax revenue administration, there is no evidence that these reduced rates have helped boost employment in the targeted sectors, activities, and areas (Cruces et al, 2010).

Table 2. Argentina: Formalization Costs 1/

	Single	First earner (spouse is informal)	Second earner (first earner is alredy formal)
(Percent of the individual's net income before formalization)			
For the employee	**17.2**	**15.7**	**19.4**
Without Children	20.5	18.7	19.8
With Children	12.6	14.3	19.1
Bottom 10 percent 2/	21.4	22.3	24.9
(Percent of gross wage before formalization)			
For the employer	**23.5**	**24.1**	**24.1**

Source: Staff estimates based on tax code and Household Survey

1/ All averages exclude outliers for which the formalizaiton cost is either greater than 100 percent or smaller than -100 percent.

2/ Refers to distribution of gross wage of all workers, formal and informal.

- *The system acts as a disincentive to formal employment, especially for low-wage earners.* We estimate the net cost of formalization for individuals in the Household Survey (see Annex I). We assume that the gross wage would not change after formalization and we compute the net cost of formalization by considering i) the taxes that the worker would pay if becoming formal (employee's SSCs and PIT), ii) less the family allowances (for child, spouse, and school aid) and (iii) less the child allowance (AUH) that the worker would lose by becoming formal.[9] The estimated net formalization cost averages 17 percent of the pre-formalization net income (gross wage plus AUH if applicable) for single individuals (in line with the SSC employee's rate). For the first earner in couples where both spouses are informal, it averages about 15½ percent of his/her net income before formalization. This rises to about 19 percent for second earners (in couples where the first earner is already working in the formal sector), as family allowance are only paid once. The cost increases further to about 25 percent for second earners at the bottom 10 percent of the distribution, for whom the minimum SSCs become binding. We also estimate the formalization cost for the employer, taking into account the dispersion of SSCs rates across sectors and regions. We find that the cost of formalizing a dependent informal worker is about 24 percent on average, somewhat below the employer's SSCs statutory rate (Table 2).

- *Different treatments between dependent workers, self-employed, and monotributistas create incentives for contracting instead of employing.* From the tax code, we estimate that employing a

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[9] However, for those dependent informal workers who receive less than the minimum wage, the salary would increase as they become formal. For them, the cost of formalization would be lower than our estimates, but for their employer it would increase.

single person with no children who provides labor intensive services (for example, IT services) and earns the average gross wage, could costs up to 60 percent more than reimbursing operating costs, taxes, and the equivalent of the average gross wage to that same person registered as a *monotributista*.[10]

C.   Is There a Better Way to Tax Labor in Argentina?

11.   A reform of labor taxation in Argentina would need to address these inefficiencies. Reducing the tax wedge would stimulate employment and formalization, especially if targeted to low-paid workers, as there is evidence that it's their employment that mostly responds to tax incentives (IMF, 2014).[11] Increasing the progressivity of the tax system would improve the redistributive properties of the system (for example, by raising more revenues to provide cash transfers at the bottom of the distribution, irrespective of family size). Finally, eliminating the wide dispersion of the tax wedge across sectors and regions, and across types of labor relations, would simplify tax administration and improve resource allocation across sectors.

12.   The theoretical literature gives some indications of what an "optimal" system of labor taxation would be. The Mirrlees-Saez model of optimal labor income taxation (see Annex II) suggests that a tax and transfer system strikes the best trade-off between efficiency (lower distortions) and equity (greater progressivity) when:

- the poorest workers receive some form of income support (a "negative" tax) through cash transfers, to be phased out rapidly as income increases;

- middle income earners are subject to low (but positive) marginal effective tax rates (MERT);[12]

- marginal effective tax rates increase with income but at a pace that flattens at high-income levels (to minimize disincentives to work for high-skilled workers).

13.   Argentina's tax and transfer system appears to be less progressive than the estimated optimal one. We calibrated the Mirlees-Saez model to Argentina, and compared the optimal marginal effective (net) tax rates from the model to the ones we estimated using the Household Survey (see Annex II). The results show that Argentina's labor taxation presents some, but not all,

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[10] We consider a *monotributista* of category E as a reference.

[11] The effects of a reduction in payroll taxes on employment depend on the tax elasticity of the demand and supply of labor. When the supply of labor is fully inelastic, a reduction in in labor taxes is fully transferred to wages, and the level of employment does not vary. However, most studies have found that reductions of labor taxes have a positive impact on both salaries and employment (Heckman and Pagés, 2004; Kugler and Kugler, 2008). The effect of tax cuts on employment tends to be stronger in periods of economic slack (IMF, 2016). Moreover, tax cuts seem to have a more positive effect on the employment of less qualified workers (Pagés, 2017). Pessino et al. (2010) found that a 10 percent reduction in payroll taxes increase formal employment by between 4 percent and 5 percent.

[12] The Marginal Effective Rate of Taxation measures the rate at which taxes (net of cash transfers) increase as income increases.

features of the optimal tax system. While it provides cash transfers at the bottom of the wage distribution (through the Universal Child Allowance and family allowances), this support is not phased out rapidly (as it extends up to the 7th decile of the wage distribution) and it is too low for the poorest. Current MERT appear appropriately high for top earners (the 10th decile of the wage distribution) and for low-to-middle income earners (from the 3rd to the 6th decile of the wage distribution) but they are lower than the model suggests for wages between the 7th and 9th deciles, owing mostly to the fact that these deciles are, de facto, not subjected to the PIT.

D. A Proposal for a Tax Reform

14.   We have simulated a package of measures that could address these distortions. In this section, we estimate the impact of a few changes in Argentina's labor taxation system on the tax indicators discussed above, and their direct fiscal cost (thus, without considering the impact on revenues through induced changes in employment and activity). The package includes:

- *Reducing SSCs for retirement benefits (that is, net of current contributions to "obras sociales") to 10 percent, for both the employer and the employee, and eliminating sectoral and regional differences.*[13] We apply the new reduced contribution rates to all individuals in the Household Survey and compute the new resulting average tax wedge and the total SSCs paid. This measure in isolation would reduce the average tax wedge by almost 9 percentage points, to 19 percent, and by 13 percent for individuals in the bottom decile of the wage distribution. The direct cost of this measure is estimated to be 1.8 percent of GDP.

- *Expanding the PIT coverage by increasing the minimum income threshold.* Cutting the "special deductions" (*deducciones especiales*, which, together with the minimum non-taxable income, determine the threshold above which labor income begins to be taxed) by 40 percent would reduce the minimum taxable income from 1.5 to 1.2 times the average wage (or from twice to 1.5 times the median wage).[14] As a result, the PIT would be levied on the richest 20 percent of the population (compared to the top 10 percent now). The tax wedge would increase by about 4 percentage points on average for the top 2 deciles of the wage distribution, whereas the change would have no effect for the rest of the workers. Because the elasticity of labor supply is generally estimated to be lower at high income level, this measure should have little impact on labor supply. The increase in revenue from this measure would be 1.5 percent of GDP.[15]

- *Phasing out family allowances at 21,000 pesos of individual income, and introducing income support for the first decile of the wage distribution by 3,600 pesos per month, on average.* This measure would increase the progressivity of the current tax and transfer system, reducing the

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[13] This amounts to set the contribution rates to 13 percent for employees and 16 percent for employers. Discounts for new employees, and the minimum and maximum on contributions would be kept unchanged.

[14] Deductions would go from 249,411 to 150,000 pesos at constant 2017 prices. Income brackets would be adjusted so that the highest marginal rate kicks in at the same total gross wage as currently.

[15] For the reform to be revenue neutral for the federal government, the greater revenue flow would have to be entirely directed to the National Administration of Social Security (ANSES) rather than subject to co-participation.

gap with the estimated optimal system (Annex II). It would be broadly budget neutral, and further reduce the tax wedge for the poorest by additional 7 percentage points.

- *Phasing out the spouse deduction gradually, as the spouse's income increases.* In the current system, the spouse deduction is eliminated entirely if the spouse income is above the minimum non-taxable income. Phasing out the deduction by one peso for each additional peso earned by the spouse up to a threshold of 8,400 pesos per month would have no impact on fiscal revenues, as almost all first earners in couples where the spouse has a wage below that threshold do not pay PIT. However, given that women constitute about 80 percent of second earners (in the Household Survey), this change could increase women's incentives to participate to the labor market, as an increase in their labor supply would not cause the first earner to lose in full the spouse deduction.

15.   The In addition to reducing the average tax wedge, the above measures would reduce net formalization costs. Based on our estimates, the tax wedge would decrease for almost all types of households by 9 percentage points on average across the wage distribution, but more so for the bottom decile of the wage distribution (20 percent) than for the top two deciles (5 percent—Table 2 and 3). At the same time, the net cost of formalization would also fall by about 9 percentage points on average for all individuals, almost entirely on account of the decline in the employee's SSCs (Table 4). Also, owing to the introduction of income support, formalization costs would now be more homogeneous across family size and income. The reduction of formalization costs for the employer instead would be around 5 percentage points. Assuming an elasticity of formal employment to formalization cost of 0.5 (Pessino and others, 2002), this package of measures could increase formal sector employment by about 2 percent and reduce informality by about 4.5 percent.

E.   Assessing the Macroeconomic Impact of the Tax Reform

Table 3. Argentina: Tax Wedge for Formal Employees Under Proposed Changes
(percent of total cost to the employer)

	All family types	Single	First earners in single-earner couple	First earner in two-earner couple	Second earner in two-earner couple
Total	**18.0**	**17.1**	**17.5**	**14.2**	**23.7**
Without Children	21.4	20.1	22.4	18.8	24.8
With Children	15.8	9.0	15.8	11.7	23.2
Bottom 10 percent 1/	-1.5	-1.9	-4.1	-5.5	11.3
Upper 20 percent 1/	29.7	30.1	28.6	29.5	29.9

Source: Staff estimates based on tax code and Household Survey
1/ Distribution of gross wages of formal employees

16.   We simulate the impact of the tax changes using a dynamic general equilibrium model. The model (described in details in Chapter 4 of the Selected Issue Papers) is an overlapping generation model with heterogenous agents and endogenous human capital accumulation. Individuals differ because of: gender (male and female), an initial human capital endowment at birth, education during the lifetime, and generation (children, young adults, adults, old). Households maximize both their and their children expected utility by jointly deciding i) how much to consume, ii) how much labor to supply in formal and informal sectors, ii) how much investment in their children education. A representative firm hires both male and female effective hours of labor to produce the formal good. The firm's profits (after taxes) are redistributed to the richest households. The government taxes formal labor (in the form of both PIT and SSCs), consumption, and firms' profits. Under a balanced budget, it provides pensions and transfers to household, and consumes only goods produced in the formal sector. The parameters of the model are calibrated to match key features of Argentina's labor market (share of formal/informal workers, wage gap between man and woman, female labor force participation), and household data (spending on children's education, before and after tax income distribution).

17.   The simulations suggest that the proposed changes would have a positive impact on economic activity and formality, with a minor cost in terms of foregone revenues. In the new steady state, GDP is 1.2 percent higher. The cut in the tax wedge stimulates the demand for formal employment, which increases by 3.4 percent. Productivity in the formal sector raises, owing to the

	Single	First earner (spouse is informal)	Second earner (first earner is alredy formal)
Table 4. Argentina: Formalization Costs Under Proposed Changes 1/			
(Percent of the individual's net income before formalization)			
For the employee	**8.4**	**9.1**	**12.0**
Without Children	9.4	10.5	10.7
With Children	6.9	8.5	12.4
Bottom 20 percent 2/	7.1	7.0	8.5
(Percent of gross wage before formalization)			
For the employer	**17.5**	**14.2**	**18.9**

Source: Staff estimates based on tax code and Household Survey
1/ All averages exclude outliers for which the formalizaiton cost is either greater than
100 percent or smaller than -100 percent.
2/ Refers to distribution of gross wage of all workers, formal and informal.

greater supply of skilled labor in formal jobs. Formal sector production increases at the expense of production in the informal sector. The average wage increases by 3 percent in real terms, which encourages more investment in human capital formation. Greater labor supply and wages in the formal sector push up revenue from labor taxation, compensating part of the direct cost of the reform (the revenue loss from the reform amounts to 0.1 percent of GDP). Greater formality and

higher prices of informal goods, which are mostly produced by low-skilled, low wage agents, increases income at the bottom of the income distribution. The impact on inequality is neutral however, as the net earnings of high-skilled, higher-earners workers in the formal sector also increases.

Annex I. The Permanent Household Survey

We use INDEC's Household Survey (EPH, *Inquesta Permanete de Hogares,* March 2017) to estimate the distribution of gross wages and relevant tax indicators.

First of all, we reshaped the survey to match spouses with one another, and to match parents with their children. For each individual who declares to be working as a dependent, we determined the status of formalization of his/her work relations depending on whether SSCs are paid. We further categorized individuals according to their tax regime (general, self-employed, *monotributista* and *monotributista social*) based on their declaration about the type of employment, and the size of their activity (in case of self-employed). Further, we make the following assumptions

Labor income is declared net of taxes (PIT and employee's SSCs), but inclusive of child allowances (depending on the applicable thresholds), spouse allowances (only for couple in which one of the spouses is active), and the universal child allowance (for informal wages up to twice the minimum wage).[1] Because only one of the parents can claim child allowances, we assign them to mothers in couples where both spouses work formally.

Net income is reported truthfully, so we do not need to adjust for under-reporting.[2]

Informal workers do not pay PIT, even if their income is above the minimum taxable.

There are no deductions for rent, living expenses, and health private insurance.

We use a necessarily simplified representation of the tax/transfer code to estimate individuals' gross wages.

1) We first impute the allowances to which each household is eligible, based on their characteristics and wages.

2) Then, we subtract family allowances, if applicable, from declared labor income to obtain after tax labor income.

3) Keeping track of the tax regime to which they are subjected (employed and self-employed, vs *monotributistas* and *monotributistas sociales*), we compute the PIT to obtain taxable income.

4) Then, we compute the SSCs that are consistent with the estimated taxable income and, hence, the individual's gross wage.

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[1] The manual accompanying the PHS (*Diseño de Registro y Estructura para las bases preliminares Hogar y Personas*, INDEC) does not specify whether labor income should be treated as gross or net.

[2] However, there is little difference between our estimates of the median and average gross wage, and those reported in the Ministry of Labor monthly labor bulletin.

5) Finally, we compute the employers' SSCs, applying the reduced rates according to the type of activity, the size and turnover of the firm, and employment span declared by each individual in the Household Survey.

With these data, we derive estimates of the average gross wage, and we obtain the distribution of wages by approximating the distribution of our estimated gross wages with the best fitting Lognormal distribution function. Then, we compute for each individual (and, hence, for the selected groups indicated in the paper) the average tax rate, the tax wedge, and the MERT.

Finally, we estimate

The cost of formalizing labor relations for first earners. We assume that all first earners who are informal formalize their labor relations at the same wage as when they are informal.[3] All singles and first earners (in couples where the other earner is either informal or inactive) who move from an informal to a formal labor market relation start paying SSCs and PIT (if applicable), lose the Universal Child Allowance (if they receive it), but start receiving family allowances (if they were eligible). For a set of typical households (WHICH ONES?), we compute the after tax-and-benefit family income as a result of formalization, and we compare it to the income before formalization. We express this difference in percent of income before formalization.

The cost of formalizing labor relations for second earners. We then repeat the calculation when it's the second earner who move from an informal to a formal labor market relation (in couples where the first earner works formally). We keep assuming that the gross wage would not change as a result of formalization, but consider the impact that this could have on the family allowances received by the first earner.

We then calculate the impact on these indicators from changes in SSCs and PIT systems (rates, deductions and exemptions). We use the ratio of average taxes collected before and after the changes to estimate the cost in terms of foregone revenues.

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[3] Formalization could imply that part of the formalization cost to the employer is transferred to the employee through a lower wage. However, making this assumption would produce higher formalization costs than we estimate.

Annex II. The Mirrlees-Saez Model of Optimal Labor Taxes

The Mirrlees-Saez model of optimal income taxation (Brewer et al. 2010) considers a government that chooses a *net* tax schedule (that is, taxes net of transfers) to maximize society's welfare (reflecting its "equity concerns"), subject to a budget constraint and individuals' choice of how much to work (reflecting its "efficiency concerns").

Specifically, let *w* be earnings per unit of effective labor (the product of time and ability). and T(w) the associated net average tax (that can be negative, if transfers are greater than taxes). Individuals choose *w* (that is, how much to work) to maximize their utility:

$$u(n) = w - T(w) - \frac{n}{1+\frac{1}{\varepsilon}}\left(\frac{w}{n}\right)^{1+\frac{1}{\varepsilon}},$$ (0.1)

where *n* is the individual potential ability and ε is the elasticity of labor supply to the marginal effective tax rate (MERT). Ability *n* is not observable, and it is distributed according to a distribution function *f(n)* (with support on the non-negative real line), and corresponding cumulative distribution function *F(n)*. To conserve unit of measurement, n is measured in pesos.

From the first order condition, the optimal level of earning (and thus of labor supplied) w^* is such that:

$$w^* = n\left(1 - T'(w^*)\right)^{\varepsilon},$$ (0.2)

This condition states that, for an individual of ability *n*, the greater the MERT the lower is the optimal effective labor supplied. For the same MERT, the greater the ability, the greater the amount of optimal effective labor supplied.

The government chooses a schedule of net taxes *T(w)* (that is, taxes minus cash transfers) to maximize social welfare:

$$\int W(u^*(n)) f(n) dn,$$ (0.3)

subject to the individual optimal decision and a budget constraint, which states that overall tax collection minus all cash benefits distributed must not be lower than a desired level $\overline{T}$:

$$\int T(w^*(n)) f(n) dn \geq \overline{T}.$$ (0.4)

Depending on its parametrization, the social welfare function $W(.)$ captures the government's aversion/tolerance to inequality.

The optimal tax function satisfies the following condition:

$$T'(n) = \frac{1 - G(n)}{1 - G(n) + \alpha(n)\varepsilon}.$$

(0.5)

The component $G(n) = \int_n^\infty \frac{W'(u^*(m))}{\overline{W'}} \frac{f(m)}{1 - F(n)} dm$ reflects government's "equity concerns". It

measures the value to society of increasing the utility of those individuals with earnings

above $w^*(n)$, being $\overline{W'} = \int_0^\infty W'(u^*(n))f(n)dn$ the value to society of increasing earnings

for all. The smaller $G(n)$, the greater the marginal effective tax on wage $w^*(n)$ (by

construction, because the government values redistribution, $G(n)$ decreases with n and it

converges to 1 as n tends to zero).

The component $\alpha(n)\varepsilon$ captures instead the efficiency concern. Indeed, $\alpha(n) = \frac{nf(n)}{1 - F(n)}$ reflects

how many individuals have wages exactly at $w^*(n)$ relative to those with greater wages. The

smaller $\alpha(n)$, the greater the marginal effective tax. This is because a higher MERT at $w^*(n)$

reduces labor supply for individuals at $w^*(n)$, but it increases the amount of taxes collected

from all individuals with wage above $w^*(n)$ (without distorting their labor supply decision).[1]

The size of the distortion at $w^*(n)$ (that is, the efficiency cost of collecting more from

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[1] As the utility function is linear in *total* taxes T(w), there is income effects from an increase in total taxes.

individuals with wages above $w^*(n)$) is captured by the amount of labor supply lost at

$w^*(n)$ through ε.

The optimal (net) tax function *T(w)* is obtained by integrating the optimal MERT function over wages:

$$T(w) = T(0) + \int_{w=0}^{\infty} T'(w)dw. \tag{0.6}$$

while the optimal initial (net) tax *T(0)* (a net transfer, if negative) is found so as to satisfy the revenue constraint.

We apply this model to Argentina. First, we use our estimates of the gross wages (and the respective marginal tax rates) of each individual in the Household Survey to obtain the distribution *f(n)*. We do this by inverting formula and then approximating the distribution of the derived *n* with a lognormal distribution, truncated above (at the median *n*) by a Pareto distribution (as standard in the literature), and with additional mass (0.06) redistributed at the bottom (to account for a greater mass of wages below the minimum in the data, relative to what is implied by the lognormal approximation). We then use the average net taxes paid on gross wages (that is, inclusive of SSCs, PITs, and net of family allowances) to compute $\overline{T}$. We assume that the welfare function presents constant relative aversion to inequality, that is $W(u) = \log(u)$, and we assume a constant elasticity $\varepsilon = 0.3$. With these parameters, we find that (see Figures II.1 and II.2):

For high wages (above 40,000 pesos per month, or in top decile of the income distribution) the current MERT of 60 percent is close to the optimal MERT from the model (Chart II.1). However, for wages between 24,000 and 40,000 pesos (approximately between the 7th and 9th deciles of the wage distribution), the optimal MERT is higher than under the current system.

Figure II.1: Optimal marginal tax rate
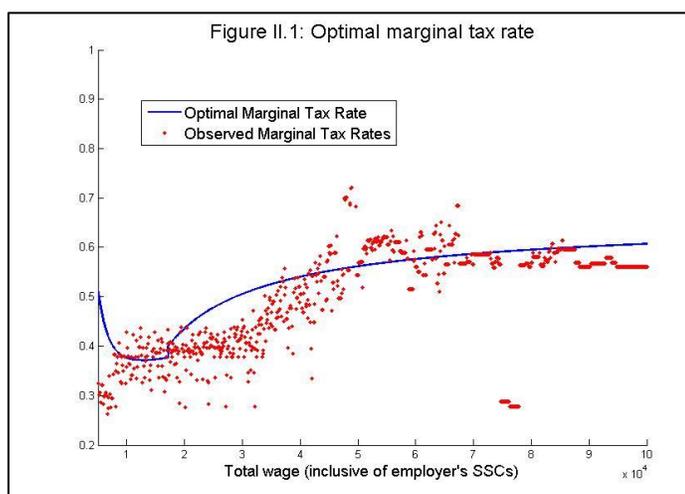
For low-wages workers, we need to look also at the *net labor income* (after taxes and transfers). If this is above the *gross wage* (the 45-degree line in Chart II.2), the worker receives a net transfer (transfers received are greater than taxes paid). The model suggests that workers with gross wages of up to 20,000 pesos per month should receive a higher level of net cash transfers than they currently do, on average (the blue line in Chart II.2—denoting the net labor income under the optimal tax system--is above the red dots that denote the average net income implied by the current system).

Figure II.2: Net Labor Income After Tax and Transfers
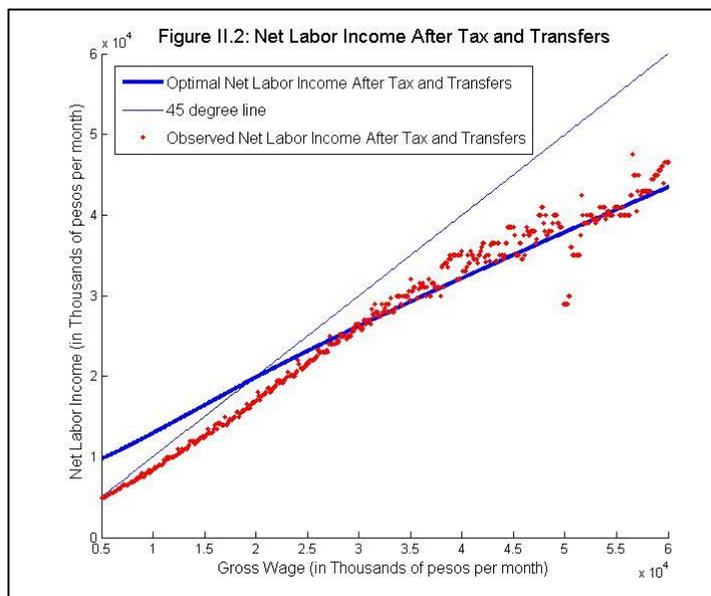
The model also predicts that these net cash transfers would need to decline at a fast pace, that is, about 5 pesos for every additional 10 pesos (the MERT for low wage workers in Chart II.1), and eliminated at a wage slightly above 20,000 pesos, the wage at which gross and net labor income equalize (slightly above the median wage). Currently, cash transfers in the form of family allowances are eliminated when wages are much higher, at around 36,000 pesos (around the 7th decile of the wage distribution). At that level, the optimal tax schedule imply that net taxes should be higher (net labor income should be lower) than under the current system (Chart II.2).

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ASSESSING THE IMPACT OF STRUCTURAL REFORMS THROUGH A SUPPLY-SIDE FRAMEWORK: THE CASE OF ARGENTINA[1]

A. Motivation

1.   Argentina's economic fortune has been on a declining path for a long time. Argentina's per capita output relative to that of advanced economies nearly halved over the past 50 years (Chart). After the end of the commodity boom of the mid-2000s, the divergence has increased again. Underlying this, has been a disappointing productivity performance: yearly labor productivity growth has been close to zero on average since 1980, compared with a 2½ percent average increase in emerging market economies (EMs).

Convergence vis-a-vis Advanced Economies
(PPP-adjusted real GDP per capita)

Source: WEO.
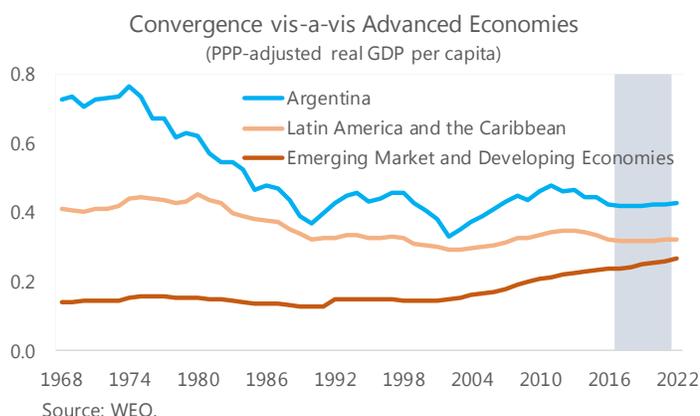
2.   Low labor productivity reflects relatively weak total factor productivity and, even more, low resource utilization (particularly capital). Years of underinvestment have left Argentina with an estimated 10 percent gap in capital intensity compared to the median of EMs (Chart).[2] As of 2017, Argentina's employment rate (67 percent of working-age population) is close to the EMs median, but 10 percentage points below the median of advanced economies, and is particularly low for women.[3] Finally, Argentina's total factor productivity growth (TFP), proxied by a simple Solow-type residual, averaged essentially zero since 1980 compared to an average growth of over 1 percent in other

Capital-Output Ratio
(Ratio; group medians)

Sources: Penn World Tables, and WEO.

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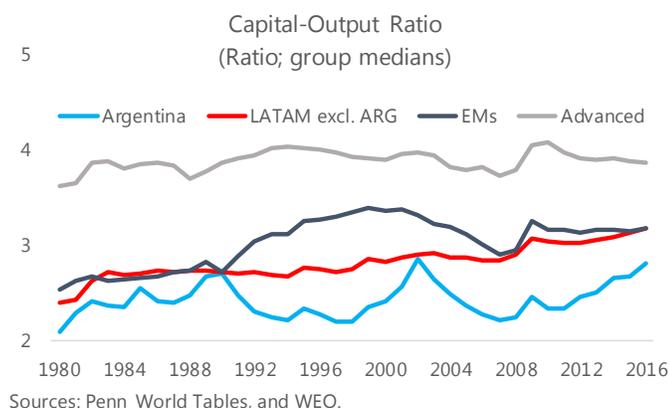
[1] Prepared by Lusine Lusinyan (WHD).

[2] IMF (2016b) discusses in detail Argentina's capital accumulation and infrastructure gaps.

[3] Artana and others (2010) show that while Argentina's gap in labor utilization—measured in per capita hours worked relative to the United States—declined since mid-1990s, it remained relatively high at close to 10 percent by 2008.

EMs. However, this measure may be biased by the relatively greater cyclical volatility of Argentina's economy over the last few decades. When adjusted for labor and capital utilization, TFP growth averaged ¾ percent per year since 1980 (BCRA, 2017).[4]

3.   Supply-side measures are needed to boost Argentina's economy's potential. Structural reforms should include opening-up the economy to international trade, increasing domestic competition, improving infrastructure, developing capital markets, and strengthening governance and institutional frameworks (for a summary of key structural policy areas, see Table 1). Without a significant reform effort, staff baseline projects only a gradual pick-up of Argentina's GDP growth over the medium term, with limited catching up vis-à-vis advanced economies.

4.   Advances in product market reforms appear particularly important. Argentina's regulatory and administrative burden on businesses is one of the heaviest among EMs (Chart). The OECD indicator of product market regulation (PMR) shows Argentina has the worst overall PMR index among 42 OECD and non-OECD countries, owing to high barriers to entrepreneurship (including complex regulatory procedures which impede firm entry/expansion, and barriers in network sectors), a weak competition policy framework, high trade and other external barriers, and a significant involvement of the state in the economy, both through state-owned enterprises and price controls (see Licetti and others, forthcoming; OECD, 2017). Particularly affected are retail and transport sectors (Appendix Figures A1–A2). A large body

Business Regulations Index and Per Capita Income

Index: 0/10=worst/best, 2014

PPP-adj. real GDP per capita relative to United States (USA=1), 2016

Sources: WEO and Fraser Institute.

of literature shows that product market reforms are likely to have a strong impact on growth and productivity (see, for example, EU, 2004; IMF, 2015a; Égert and Gal, 2016; Bouis and others, 2016). In addition to lowering the cost of doing business, well-functioning product markets facilitate a better allocation of resources across firms and sectors, lead to a better utilization of labor and capital, and yield stronger incentives to innovate.
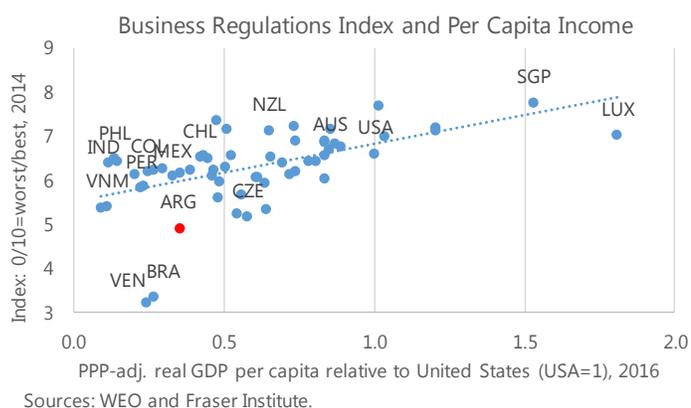
5.   Reforms of labor market regulations and tax systems would also likely increase efficiency and resource utilization. Stringent labor market regulations, such as high firing costs and restrictions on temporary employment, hamper efficient allocation of resources in the economy, discourage investment, and lead to labor underutilization and informality (see companion Selected Issues Paper, Chapter 3). High tax burden, especially on labor, have similar adverse effects on investment, labor utilization (particularly formal employment), and overall competitiveness of the economy (see companion Selected Issues Paper, Chapter 1).

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[4] TFP growth is very volatile with or without adjusting for resource utilization.

6.   **The main objective of this paper is to quantify the impact of structural reforms on long-term GDP growth in Argentina**. We use a supply-side framework based on a production-function approach, following Égert and Gal (2016), to assess the role of the reforms in boosting long-term GDP growth through their impact on (i) capital accumulation, (ii) labor utilization, and (iii) total factor productivity or efficiency.[5] A key advantage of this method is that it presents GDP growth as the *sum of separable and independent supply-side components*, allowing us to analyze the effect of reforms for each component separately first and then together to obtain the overall impact on growth. The main novelty in our paper is that we proxy TFP with an estimated measure of efficiency (using a stochastic frontier analysis approach) rather than a Solow-type residual.

7.   **The paper finds that structural reforms can have significant impact on long-term GDP growth through all three supply-side channels**. The largest effect of structural reforms generally comes through the productivity/efficiency channel. We find that regulatory changes that promote competition and ease labor market regulations (especially facilitating flexible forms of employment) matter the most for the efficiency channel. Pro-competition regulation also appears to improve labor utilization, together with lower tax rates on income and payroll, while lower entry barriers (cost of starting a business) and trade tariffs are especially important for capital accumulation. For Argentina, policies to promote capital and labor utilization promise to have larger payouts, given the size of the gaps accumulated in both areas. An ambitious reform effort, which were to improve business regulatory environment (closing half the gap with Australia and New Zealand over two decades), would add 1–1½ percent to average annual growth of GDP. Reducing trade tariffs and payroll taxes (closing half the gap with Australia and New Zealand) could *each* boost average annual real GDP growth by about 0.1 percent.

B.   Framework and Data

8.   **A production function approach is used to estimate the impact of structural reforms on GDP growth**. Following Égert and Gal (2016) and Égert (2017a), we quantify the impact of structural reforms on per capita GDP growth based on the following production function framework

$$\Delta ln \left(\frac{Y}{N} \right) = \frac{\alpha}{1-\alpha} \Delta ln \left(\frac{K}{Y} \{z\} \right) + \Delta ln \left(\frac{E}{WP} \{z\} \right) + \frac{1}{1-\alpha} (\Delta TE\{z\}) \tag{1}$$

| GDP growth per capita | Change in capital-output ratio | Change in employment rate | Change in technical efficiency |

where α is the output elasticity of capital and z is a set of structural variables, including indicators of product and labor market regulations (see Appendix 1 Table A2). The specification in Eq. (1) assumes constant returns to scale and a constant working-age population ratio. Different from Égert and Gal (2016), the change in TFP is not derived as a Solow-type residual but is proxied by a change in

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[5] The paper does not cover short-run dynamics and the adjustment costs of the reforms.

technical efficiency, estimated with a stochastic frontier analysis (SFA) approach (see Box 1 and Appendix 2). In the SFA framework, the change in TFP can be expressed as a sum of (i) the change in the country-specific technical efficiency, and (ii) the technological change common to all countries. For our analysis, we assume that the common technological change is zero, as this is a component of GDP growth which is unlikely to be affected by Argentina's (or any small country) specific reform.

9.   The link between structural variables and each supply-side channel is estimated separately. Following the literature (for example, Barnes and others, 2013; Bouis and Duval, 2011; Égert and Gal, 2016; Égert 2017a), cross-country, reduced-form panel data regressions are estimated for both the capital-output ratio and employment rate, relating them to both structural and macroeconomic variables. We rely mostly on random-effects model with robust standard errors (as opposed to cross-sectional or between estimates) as this allows us to capture both cross-sectional (between-country) and time-series (within-country) information.[6] This is important because, while we expect structural variables to vary more across countries, factor utilization is most likely to be affected by within-country cyclical fluctuations. Technical efficiency is estimated within an SFA approach, conditional on the same set of structural and macroeconomic variables (see Box 1).

10.   A sample of about 60 advanced and emerging economies is used in the paper. We build a sample of 32 EMs (of which seven Latin American countries) and 27 advanced economies covering the period of 1980–2016 (the sample periods, however, vary for different variables depending on data availability). Real output, total stock of capital, employment, and other macroeconomic data are mainly from the IMF WEO database, The Penn World Tables, and World Bank WDI. A wide range of data sources are used for structural variables covering the areas of business regulations, labor market, taxation, trade barriers, governance, educational attainment, wealth, energy use, and financial development (see Appendix 1 for data description).

C. Structural Reforms and Impact on Capital, Labor, and Efficiency

Capital Deepening

11.   There is evidence in the literature that product market reforms affect investment and capital accumulation. Regulation affects investment through its impact on: (i) price markups and entry costs, which affect the number of firms (Blanchard and Giavazzi, 2001; Alesina and others, 2005); (ii) the cost of adjusting or expanding the capital stock for existing firms; and (iii) the rate of return on capital, which affects the demand for capital. The empirical literature on investment has emphasized the role of macroeconomic and financial determinants at the expense of structural drivers. Still, there is some evidence that less restrictive product market regulation is conducive to greater capital deepening (see Égert, 2017b).[7] Alesina and others (2005), for example, explore the

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[6] The appropriateness of a random-effects model is tested and confirmed through the Hausman test (not reported in the paper).

[7] The relation between PMR and capital-intensity (which is the inverse of capital productivity) may, however, not be straightforward: if more efficient markets make capital more productive, less capital would be needed to

link between product market regulation and investment at a sectoral level (for network industries) and find that entry barriers are negatively related to investment in OECD countries. Simulations based on general equilibrium models also tend to illustrate the positive impact of product market reforms on capital accumulation (de Bandt and Vigna, 2008). In contrast, Bouis and others (2016), looking at major reform episodes in five network industries, do not find evidence that product market deregulation boosts investment. In our analysis, we explore the relation between a number of structural variables (see Appendix Figure A3) and the capital-output ratio, controlling for macroeconomic (output) volatility (which we expect to discourage investment).

12.   **Our results confirm that reducing entry barriers, especially the cost of starting a business, and trade tariffs boost capital deepening** (Appendix Table A3). This is in line with the finding in the literature that only policies that affect firms' cost of entry have long-run effects on investment (Blanchard and Giavazzi, 2003; Schiantarelli, 2010).[8] In addition, we find that capital intensity is affected (negatively) by output volatility and (positively) by the availability of private credit and latest technologies. The latter variable is related to the degree of trade openness and is used instead of trade tariffs in some specifications. Variables that proxy the cost of capital (corporate tax rate, real interest rate, relative investment prices) and labor market regulations do not seem to be strongly associated with investment. Simulations show that cutting the cost of starting a business (proxied by the number of required procedures) to close half the gap relative to the average of Australia and New Zealand would increase Argentina's capital-output ratio by 0.2 percentage points, bringing it closer to the median of EMs and regional peers. The increase would be more modest (less than 0.1 percentage point) if Argentina's trade tariffs were reduced half way to the levels in these two countries.

Employment Rate

13.   **A large body of literature has looked at the effects of structural policies on labor market outcomes**. A recent reassessment of such policies in advanced economies by Gal and Theising (2015) confirms earlier results of a positive impact on employment from a smaller tax wedge on labor (see also IMF, 2015b), lower unemployment benefits, and stronger active labor market policies. More competition-friendly product market reforms (which lower markups and prices and thus increase the demand for final goods) should stimulate firms' demand for labor and increase real wages (so that labor supply increases to match the greater demand for labor). Empirical evidence generally confirms that product market deregulation is likely to boost employment (see, for example, Nicoletti and others, 2001a/b; de Bandt and Vigna, 2008; Fiori and others, 2012; Gal

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same output, and K/Y would be lower. This is unlikely the case for Argentina, though, which starts from a very low capital-output ratio (the stock of capital grew at an average annual rate of 2.8 percent since 1980, compared 3.7 percent in the regional peers, 4.2 percent in EMs, and 3.1 percent in the advanced economies).

[8] Blanchard and Giavazzi (2003) show that product market deregulation which does not lower entry costs (number of firms remains unchanged) would have only short-term effects resulting in firms' exit and the return of the economy to its pre-deregulation equilibrium. Instead, lower entry costs decrease the rents the firms require to ent the market and lead to entry of firms and more competition in the long run.

and Theising, 2015; Schiantarelli, 2016). Evidence from both advanced and emerging market economies suggests that more rigid labor market institutions (stricter employment protection legislation or EPL) tends to negatively affect employment rates of more disadvantaged workers (women, less educated, youth) and could lead to greater labor market segmentation and informality (Muravyev, 2014). Fiori and others (2012) and Bouis and others (2016) find that, in countries with more stringent EPL, product market reforms have greater potential to deliver job gains.[9] In our analysis, in addition to structural indicators showed in Appendix Figure A4, we include the output gap (to account for the macroeconomic conditions) and several demographic variables (such as shares of female and children in the population, and dependency ratios).

14.   Results from panel data regressions show a robust positive link between employment rate and pro-competition regulation (Appendix Table A4). Implementing product market reforms to close half the gap with the average of Australia and New Zealand would increase Argentina's employment rate from the current 67 percent to 73. Changes in labor market regulations are not strongly related to the overall employment rate, in line with the literature. Instead, the effect of changes in the tax rate appears statistically important, though small (both with or without the interaction with tax compliance). A reduction in Argentina's top marginal income and payroll tax rate from the current 58 percent to 50 percent is associated with an increase in Argentina's employment rate of about one percentage point.

Efficiency of Factor Utilization

15.   Total factor productivity is generally found to be the main channel through which structural reforms affect growth. Many studies (especially at firm- and industry-level) find robust evidence that pro-competition product market reforms help increase TFP growth (Nicoletti and Scarpetta, 2003; EU, 2004; Faini and others, 2006; Buccirossi and others, 2009; Bourles and others, 2013; IMF, 2015a; Dabla-Norris and others, 2016; Bailliu and others, 2016; Égert, 2017c). While labor market deregulation generally appears to have a smaller positive impact on TFP (Bouis and Duval, 2011), some studies find that stringent employment protection does lower productivity growth (Bassanini and others, 2009, and Cette and others, 2014). IMF (2015) shows that the most significant productivity gains for EMs are associated with reforms that improve business regulations, ease labor market restrictions, and fiscal structural reforms.[10] While all these studies tend to derive TFP as a Solow-type residual, we estimate technical efficiency using a SFA approach (see Box 1 and Appendix 2). This has the advantage to simultaneously estimate efficiency in the production function and its determinants. In addition to structural indicators, we control for the impact of the change in terms of trade and the output gap.

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[9] The basic intuition behind this is that the response of employment to product market deregulation depends on how far the economy is from the full-employment level. In countries with more stringent EPL, real wage exceed market-clearing levels and the economy is far away from full employment. Hence, a decrease in as a result of deregulating product markets is more effective at the margin compared to the situation where EPL is less stringent and employment is closer to full employment levels.

[10] Capital market development also has the potential to deliver large benefits, especially when accompanied by a reform of the legal system and property rights.

16.   Our result show that efficiency is strongly associated with both product and labor market indicators. The results from a full-fledged SFA (Appendix Table A6) suggest that regulations promoting competition (the combined index of perceived regulatory quality from WB-WGI, 2016) and less regulated labor market (especially in terms of working time regulation) lead to greater efficiency (that is, lower inefficiency in the SFA model and Appendix Table A6).[11] This is especially relevant for Argentina as these are areas where the country seem to underperform relative to others (Chart)—hence, there is a greater scope to catch up. Using the conservative (lower-bound) estimate of the elasticity of technical efficiency with respect to the indicator of pro-competition regulations, suggests that Argentina's efficiency could increase by over 10 percent if reforms were to close half the gap with Australia and New Zealand[12]. It is important to note that this is unlikely to happen quickly, and would likely require many years of sustained reform effort.[13] Other potential determinants of efficiency, such as measures of human capital have not been found robust in our SFA regressions.

Policies and Regulations Promoting Competition
(Index from -2.5=weak to 2.5=strong)

Argentina
Advanced
EMs
LATAM excl. ARG

Source: World Bank WGI, 2016 Update.
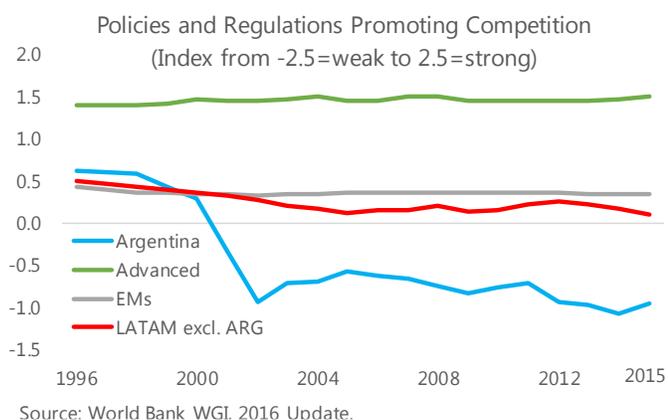
Box 1. Production Frontier and Efficiency: A Simple Illustration

For a given set of countries, a *production or efficiency frontier* is the greatest level of output that is possible to produce given the factors of production utilized, and the technology adopted. The further away a country's actual output is from the efficiency frontier, the less technically efficient is the country. This distance depends on country-specific characteristics. To estimate this frontier and a country's distance from it, a stochastic frontier analysis (SFA) technique is used in this paper (see Appendix 2 for technical details). In this setting, the efficiency of production is not a residual from the estimated production function, but a more "structured" variable—its mean and/or variance reflect factors (including structural determinants) that explain the level and volatility of efficiency across countries. Country-specific random shocks are expected to capture the cyclical variability of efficiency at the country level, while common time effects capture the impact of global shocks.

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[11] To better control for cyclical effects, output gap (as a proxy for such effects) is included in some specifications (Appendix Table A6, columns 5–7), although in principle there may not be a clear delineation between underutilization of resources because of exogenous shocks or because of underlying inefficiency. The results show the expected negative sign between more the output gap and inefficiency (that is, the more positive is the output gap, the smaller is the distance from the frontier) but do not significantly affect other estimates.

[12]That is, with the average value of the WB-WGI (2016) indicator for these countries in 2015.

[13] To put this into perspective, in the scale of -2.5=weak to +2.5=strong for the WB-WGI regulatory quality index, Australia's indicator improved by about 0.6 points in twenty years from 1996. For Argentina, closing half the gap with the average of Australia and New Zealand would imply an improvement more than twice as large.

Box 1. Production Frontier and Efficiency: A Simple Illustration (Concluded)

To illustrate the results of SFA, in a simple case output per worker is modeled as a function of capital per worker (see Appendix Table A5 for estimation results). The results show that as of 2016, given its very low level of capital per worker, Argentina was somewhat behind the production function but the distance was not out of line compared to other (more capital-intensive) economies (Chart). This is in line with BCRA's growth accounting framework (BCRA, 2017) showing that Argentina's low labor productivity growth seems more a consequence of underinvestment in physical capital. However, our results also show that the estimated efficiency for Argentina has worsened in the last decade, whereas the median of EMs and the full sample of countries remained broadly unchanged (Chart). Compared to the average technical efficiency of Australia and New Zealand in 2016, Argentina was more than 10 percent inefficient. Furthermore, the aggregate efficiency performance likely masks important differences in intersectoral productivity (not covered in this paper). For example, there is evidence that productivity growth in the agricultural sector has been relatively upbeat (Dabla-Norris and others, 2013).
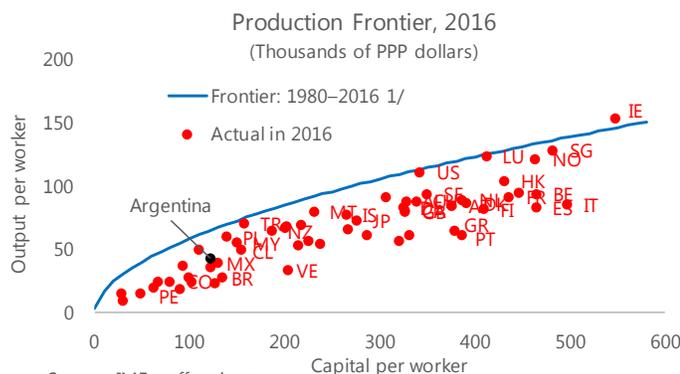
Production Frontier, 2016
(Thousands of PPP dollars)

Source: IMF staff estimates.
1/ Heterogenous and heteroskedastic efficiency model.

Output per Worker (Y/L) and Technical Efficiency (TE)
(Thousands of PPP dollars unless otherwise indicated)
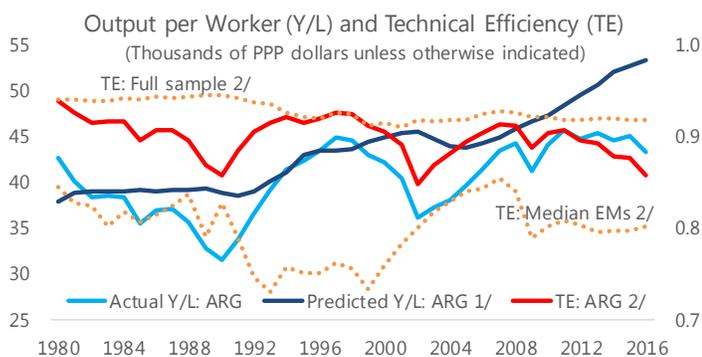
Source: IMF staff estimates.
1/ Heterogenous and heteroskedastic efficiency model; 2/ Index, right axis.

D. What is the Potential Impact of Structural Reforms on Growth?

17.   Finally, we combine the effects of structural reforms on efficiency, capital, and labor. We use Eq. (1) and the results from the previous Section on the estimated elasticities of efficiency, capital, and labor with respect to changes in structural variables (z).[14] We focus on the effects of the four policy changes which have been found to have the strongest impact on capital intensity, employment rate, and efficiency in our cross-country regressions, that is: (i) measures that make product market regulation more competition and private-sector friendly, in particular by reducing the costs to start a business; (ii) measures that ease labor market regulations, in particular by

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[14] Output elasticity of capital, α, is set to 0.33 in simulations, which is the standard value in the literature but is on the low side compared to 0.57 (implied from the recent values from Penn World Tables for Argentina) or about 0.61 estimated in Appendix Table A6.

facilitating flexible forms of work arrangements; (iii) eliminating trade tariffs; and (iv) cutting top marginal income and payroll tax rate.

18.   Illustrative simulations suggest that structural reforms could have substantial effects on long-term GDP growth. We simulate the impact on long-term GDP growth of structural reforms that would get Argentina closer to Australia and New Zealand, two countries that have experienced significant reforms in the past and tend to show the highest scores in many structural indicators considered in this paper. We thus assume that, following the reforms, the structural policy variables for Argentina would slowly converge to the average value for Australia and New Zealand, with *half the distance* covered over a twenty-year period. For example, introducing measures to reduce the gap in the cost of starting a business (an area where Argentina's gap with the frontier is the largest) would be associated with additional annual GDP growth of 0.15 percent only through the increase in capital intensity and about one percent through both the capital and efficiency channels (Chart).[15]

Structural Reforms and GDP Impact through Efficiency (TE), Labor (L) and Capital (K) Channels
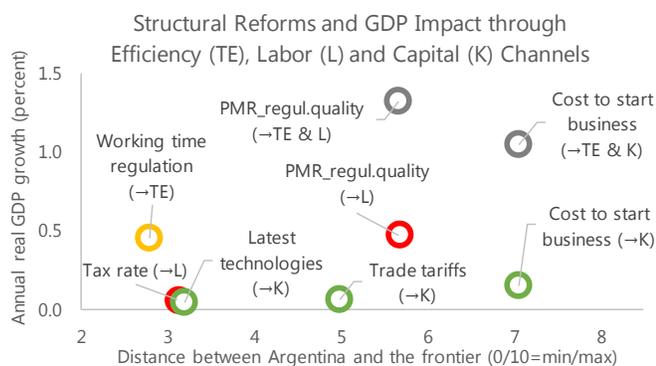
Source: IMF staff estimates.
For each policy variable, the chart shows Argentina's distance from the frontier and the estimated increase in annual growth rate of real GDP if half of the distance is closed in twenty years, together with the supply-side channel through which GDP is affected.

E. Conclusion

19.   Structural reforms will take time to materialize but are essential to boost Argentina's economic potential in a sustained way. Argentina's catching up with advanced economies in terms of GDP per capita requires a series of structural reforms that will take a long time to get ingrained. In Australia, for example, one of the benchmark counties in this paper, wide-ranging structural reforms continued for over three decades.[16] This paper provided some quantitative insights into potential long-run effects that structural reforms could have on Argentina's growth.

20.   Policies and regulations which would promote investment and capital deepening should be at the core of the structural reform agenda. Facilitating firm creation and entry, including by reducing high costs to start a business, and opening the economy to trade, by lowering

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[15] For Argentina, OECD (2017) finds that implementing a wide range of structural reforms to converge to the OECD average over a ten-year period would add 1½ percent to the annual growth rate. Estimates from existing studies for other EMs suggest similar large effects from structural reforms: for example, Bailliu and others (2016) estimate that implementing the structural reforms planned since 2014 in China, India, Indonesia, and Mexico (including product market reforms, trade and FDI liberalization, and infrastructure investment), would increase average annual real potential GDP by 1½–2 percentage points.

[16] Structural reform process in Australia started in the 1970s, with tariff reductions; accelerated in the early 1980s, by further opening to trade, and in the late 1980s/1990s, with a focus on labor market reforms (shifting wage bargaining from centralized to enterprise level) and lowering company tax rate; and consolidated in the 1990s with strengthening competition policies (Banks, 2005).

tariffs and promoting technology spillovers, would contribute to growth through greater capital deepening and efficiency gains. In addition, productivity could further benefit from less restrictive labor market regulations, while lower tax burden and pro-competition policies and regulations would boost growth mainly through higher employment and efficiency.

Table 1. Argentina: Structural Policy Areas: Distortions, Effects, and Reform Actions

Main Distortion	Impact Channels and Implications	Reform Actions
Domestic competition		
Entry barriers (complex regulatory procedures, high administrative burden)	Low investment, limited firm creation and innovation leading to low productivity, limited job creation and low employment	Simplify regulations, coordinate across levels of government, improve governance
State control (regulated prices, subsidies, protection to SOEs, subsidized lending)	Low investment and efficiency, limited labor market flexibility, price distortions	Phase out price controls, rationalize subsidies, reduce state involvement, ensure regulatory neutrality, including by reviewing/removing regulatory protection of incumbent companies
Inefficient network industries	Low productivity, high cost of doing business	Open sectors to competition, strengthen regulatory framework
Weak competition framework	Weak enforcement and ineffective regulation, cartel behavior, disincentives to invest and innovate	Pass the Competition Law to strengthen anti-trust authority
Uncertain regulatory framework in network industries (e.g., energy)	Low investment and inefficiency in key network industries affecting input costs and productivity of the economy	Clarify and strengthen regulatory framework, ensure independence of regulatory bodies
Foreign competition		
Tariff and non-tariff barriers	Limited competitive pressure, low investment and efficiency, high cost of doing business	Reduce tariff and non-tariff trade barriers
Low trade integration	Limited competitive pressure, low investment and efficiency, limited technology spillovers	Promote integration through FTAs and GVCs
Low FDI	Limited competitive pressure, low investment and efficiency, limited technology spillovers, limited transfer of better management practices	Reduce barriers to investment by implementing a comprehensive reform of investment climate (including governance, red tape, infrastructure)
Labor market		
High termination costs	Low or inefficient use of labor, high informality, low human capital accumulation, low productivity; high cost of adjustment leading to low investment	Reduce termination costs, protecting workers with unemployment insurance and training instead of strict labor regulations
Restrictions on temporary work and flexible work arrangements	High cost of adjustment, low investment, low use of labor (negative impact on female and youth participation), high informality	Make work arrangements more flexible, including in terms of working time regulations; allow temporary contracts with few restrictions and protection increasing with job tenure
Tax burden		
High taxes on labor income	High labor cost, low use of labor, high informality	Reduce tax wedge
Distortionary taxes, such as financial transaction tax	Low financial intermediation, which affect investment and allocative efficiency	Phase out financial transaction tax

Sources: IMF staff, OECD, and World Bank (various publications).

Appendix I. Data Sources and Description

Table A1. List of Countries	
The country sample includes 59 advanced and emerging market economies:	
Advanced economies (27)	Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong SAR, Iceland, Ireland, Israel, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, Taiwan Province of China, United Kingdom, United States
Emerging market economies (32)	Argentina, Brazil, Bulgaria, Czech Republic, Chile, China, Colombia, Cyprus, Estonia, Hungary, India, Indonesia, Korea, Latvia, Lithuania, Malaysia, Malta, Mexico, Pakistan, Peru, Philippines, Poland, Romania, Russia, Slovak Republic, Slovenia, South Africa, Thailand, Turkey, Ukraine, Venezuela, Vietnam

Table A2. List of Variables

Variable	Description	Source
Output (real GDP)	Real GDP in billions of constant 2011 international dollars.	IMF WEO
Labor	Number of persons engaged, includes employees and self - employed (in thousands), extended with employment growth rate from IMF WEO.	PWT9.0
Capital	Total capital stock in billions of constant 2011 U.S. dollars, extended with depreciation and investment from IMF WEO; capital stock to readjusted for Argentina after 2002 with investment series from the revised National Accounts.	PWT9.0
Private capital	Private capital stock (constructed based on private investment flows), in billions of constant 2011 international dollars.	IMF (2017)
Public capital	General government capital stock (constructed based on general government investment flows), in billions of constant 2011 international dollars.	IMF (2017)
Output gap	Estimated with panel-data Hodrick-Prescott filter; as robustness, IMF WEO data on output gap are also used.	IMF WEO
Output volatility	Coefficient of variation of real GDP (ratio of 5-year rolling-window standard deviation to mean).	IMF WEO
Change in terms of trade	Change in terms of trade.	IMF WEO
PMR: regulatory quality	Measures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development; estimate of governance (ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance).	WB-WGI (2016)
Cost of starting a business	Number of procedures to start a business.	WEF
Trade tariffs	Trade-weighted average applied tariff rate. An applied tariff is a customs duty that is levied on imports of merchandise goods, calculated as a weighted average of all the applied tariff rates, including preferential rates that a country applies to the rest of the world.)	WEF
PMR: WEF_market dominance	Extent of market dominance; index ranging from 1 (dominated by a few business groups) to 7 (spread among many firms).	WEF
Private credit to GDP	Domestic credit to private sector, percent of GDP	WB-WDI
LMR: CBR_total	Labor regulation index, calculated as the average of all sub-indices which cover five areas of labor law: (i) definition of employment relationship and different forms of employment; (including the regulation of the parties' choice of legal form, and the rules relating to part-time, fixed-term and temporary agency work); (ii) working time; (iii) dismissal; (iv) employee representation; and (v) collective action. Index values range from 0=no protection or the lowest protection offered to workers, to 1=maximum or highest protection offered.	CBR-LRI

Table A2. List of Variables (Concluded)

Variable	Description	Source
LMR: CBR_working time	Labor regulation index, calculated as the average of sub-indices pertaining to laws and regulations that govern working time. Index values range from 0=no protection or the lowest protection offered to workers, to 1=maximum or highest protection offered.	CBR-LRI
Top marginal income & payroll tax rate	Top marginal income and payroll (wage) tax rate, percent	Fraser (2016)
Tax compliance	Cost of tax compliance; based on World Bank's Doing Business data on the time required per year for a business to prepare, file, and pay taxes on corporate income, value added or sales taxes, and taxes on labor; from 0 hours to maximum 892 hours.	Fraser (2016)
Availability of latest technologies	Availability of latest technologies; index ranging from 1 (not available) to 7 (widely available).	WEF
Share of female in population	Female population, percent of total population	WB-WDI
Energy use	Total energy use, kg of oil equivalent	WB-WDI
WEF_government effectiveness	Measures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies; estimate of governance (ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance).	WB-WGI (2016)
Political stability	Measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism; estimate of governance (ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance).	WB-WGI (2016)
EM (or AE) dummy	Country dummy variable = 1 of country is emerging market (or advanced) economy; 0 = otherwise.	

Figure A1. Restrictiveness of Product Market Regulations (PMR)
(Index from 0=least restrictive to 6=most restrictive)
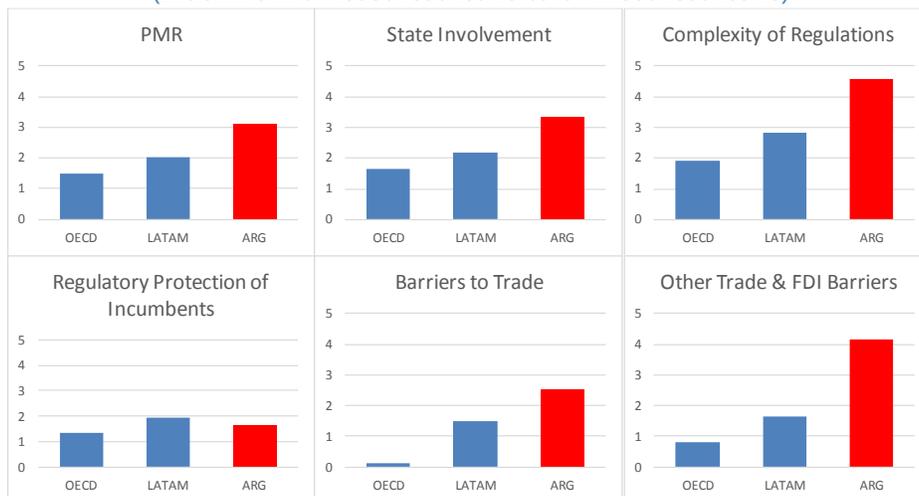
Sources: OECD Going for Growth 2017, and OECD Economic Surveys: Argentina 2017.
Note: LATAM=average of Chile, Colombia, Mexico, Costa Rica, and Brazil.

Figure A2. Restrictiveness of Sectoral Regulation
(Index from 0=least restrictive to 6=most restrictive)
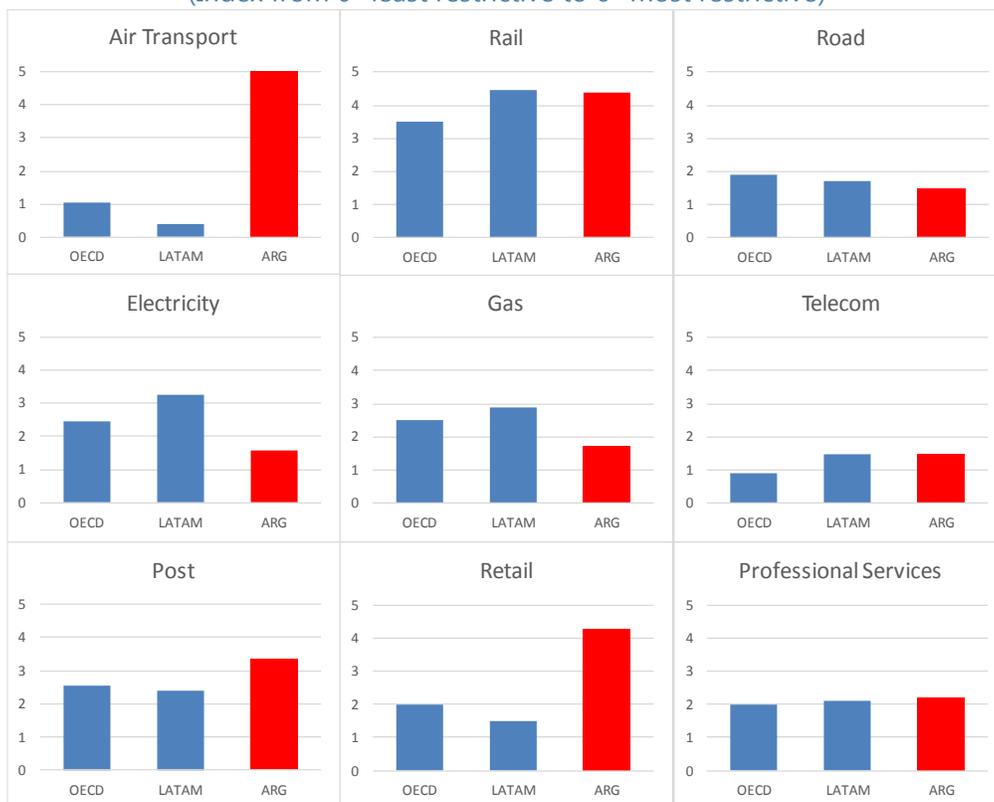
Source: OECD Going for Growth 2017.
Note: LATAM=average of Chile, Colombia, Mexico, Costa Rica, and Brazil.

Figure A3. Capital Deepening and Structural Measures

Capital-Output Ratio and Costs of Starting Business, 2016

Capital-Output Ratio and Trade Barriers, 2016
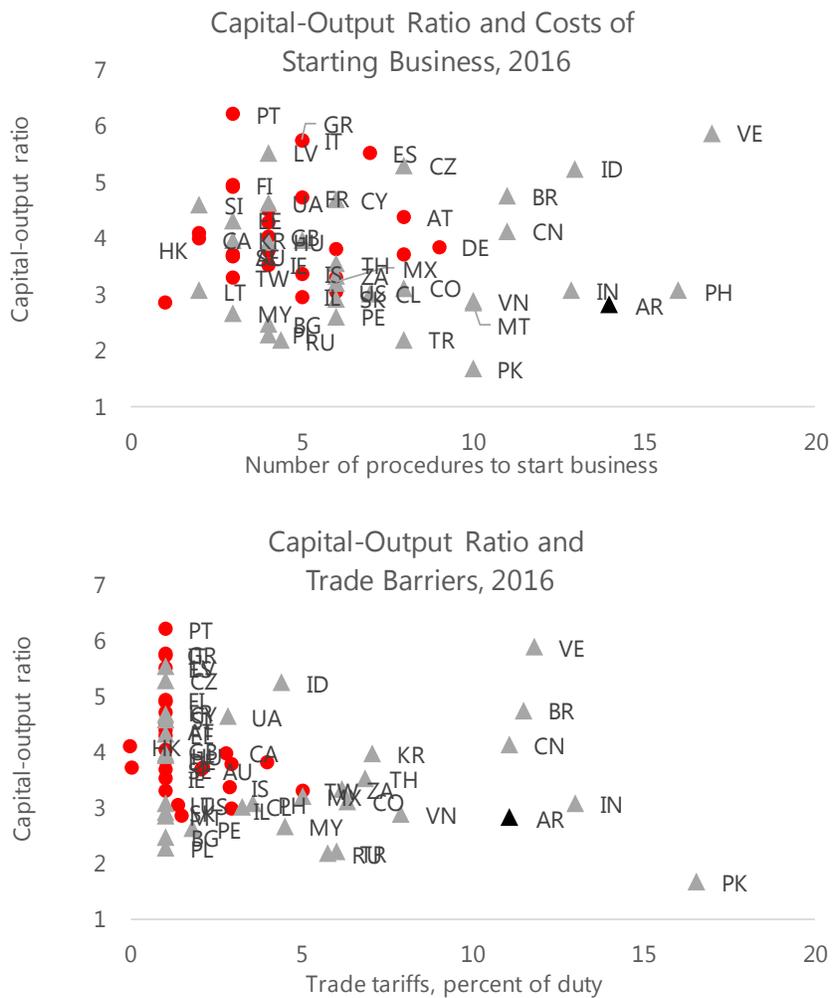
Sources: World Bank, Penn World Tables, WEF, and WEO.

Figure A4. Employment Rate and Structural Measures

Employment Rate and Regulatory Quality, 2015

Employment Rate and Labor Market Regulation

Employment Rate and Tax Rate
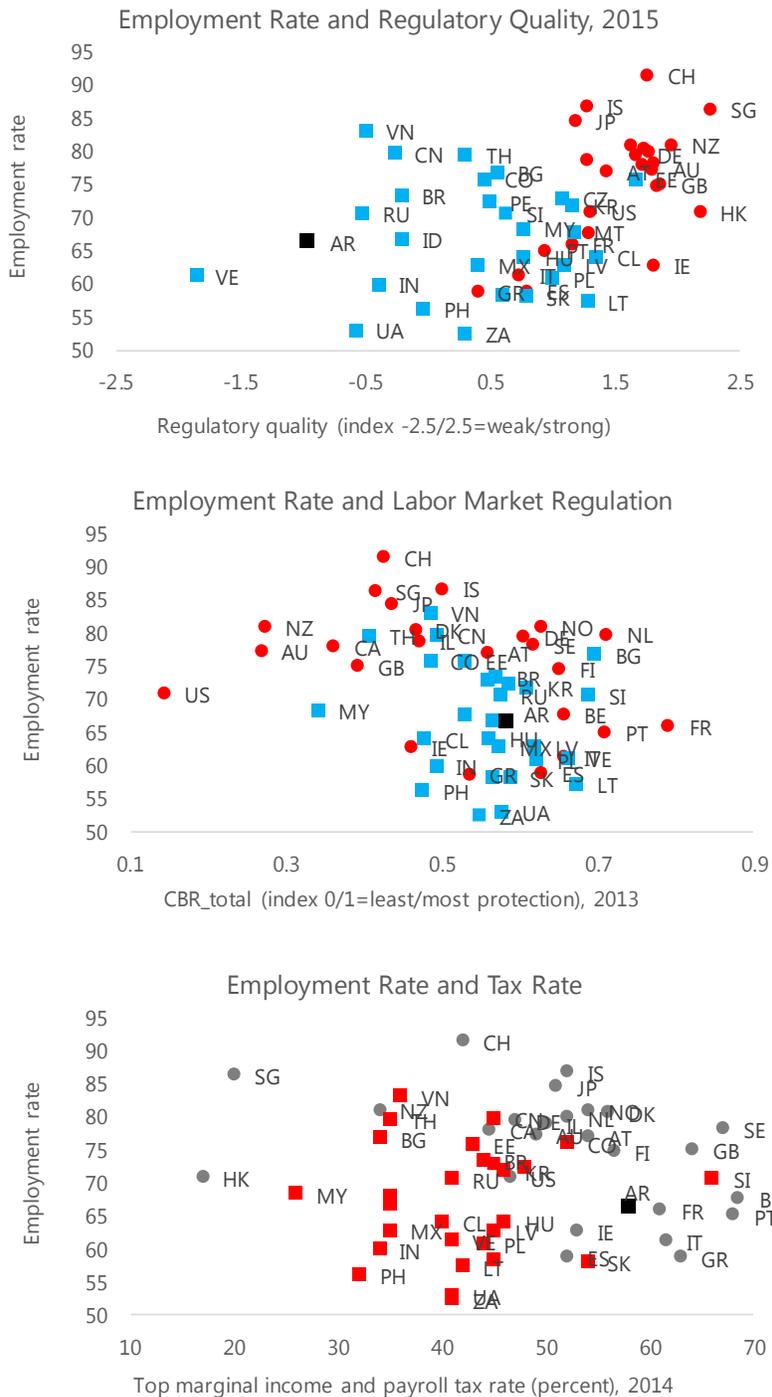
Sources: World Bank, Penn World Tables, Fraser, and CBR Labour Regulation Index Dataset, University of Cambridge.
Note: Excludes Luxembourg and Cyprus.

Appendix II. Stochastic Frontier Analysis

SFA: Main Elements[1]

The level of output for country i at time t, denoted with $Y_{i,t}$ can be represented as

$$Y_{i,t} = \{f(X_{i,t}, t; \beta) \cdot exp(v_{i,t})\} \cdot \theta_{i,t}(z_{i,t}; \gamma) \tag{1a}$$

where the first term in $\{\dots\}$ is the country-specific *efficiency frontier*, in which $X_{i,t}$ denotes the quantities of inputs (e.g., labor and capital), β is the vector of parameters that define the production function (common to all countries), t is time trend (proxy for technological change), and $exp(v_{i,t})$ is a random shock which captures measurement errors and exogenous shocks. The second term, $\theta_{it}(z_{it}; \gamma) \in (0,1]$, captures the time-varying distance of actual output from the efficiency frontier, and is referred to as the degree of *technical efficiency*, such that $\theta_{it} = 1$ indicates that the country is achieving the optimal output with the technology embodied in the production function $f(\cdot)$. Technical efficiency, in turn, is conditional on explanatory variables $z_{i,t}$, such as structural policy variables, with the vector of parameters γ. The SFA technique used in the paper allows for a simultaneous estimation of the parameters of the stochastic frontier and of the technical efficiency with a maximum likelihood method (see Battese and Coelli, 1995).

For a log-linear Cobb-Douglas production function, with capital (K) and labor (L) as inputs, and $u_{i,t} = -\ln(\theta_{i,t})$ denoting *inefficiency*, eq. (1a) can be written as follows:[2]

Frontier: $\quad\quad\quad \ln Y_{i,t} = \beta_0 + \beta_t t + \beta_L \ln L_{i,t} + \beta_K \ln K_{i,t} + v_{i,t} - u_{i,t} \tag{2a}$

Model of inefficiency: $\quad u_{i,t} = z_0 + \gamma_z z_{i,t} + w_{i,t} \tag{3a}$

The point estimates of technical efficiency (TE) can be derived via $E[exp\{-u_{i,t}|\varepsilon\}]$, where $\varepsilon = v_{i,t} - u_{i,t}$ is the model error term comprised of the two independent, unobservable error terms. The coefficient $\widehat{\beta}_t$ on the time trend represents the change in the frontier output caused by technological change. Kumbakhar and Lovell (2000) show that a change in TFP, defined as output growth unexplained by input growth, can be expressed as

$$\Delta TFP = \Delta T + \Delta TE + (\epsilon - 1)\left[\frac{\epsilon_L}{\epsilon}\Delta x_L + \frac{\epsilon_K}{\epsilon}\Delta x_K\right]$$

where $\Delta T = \widehat{\beta}_t = \frac{dy}{dt}$ is technological change, $\Delta TE = -\frac{du}{dt}$ is change in technical efficiency, and $\epsilon_L(\epsilon_K)$ output elasticities with respect to labor (capital), with $\epsilon = \epsilon_L + \epsilon_K$ specifying returns to scale ($\epsilon = 1$ is the case of constant returns to scale).

_____

[1] Based on Cardarelli and Lusinyan (2015).
[2] A more general translog form [$\ln Y_{i,t} = \beta_0 + \beta_t t + \beta_L \ln L_{i,t} + \beta_K \ln K_{i,t} + 0.5\left[\beta_{LL}(\ln L_{i,t})^2 + \beta_{KK}(\ln K_{i,t})^2 + \beta_{tt}t^2\right] + \beta_{KL}(\ln L_{i,t})(\ln K_{i,t}) + \beta_{Lt}t \cdot \ln L_{i,t} + \beta_{Kt}t \cdot \ln K_{i,t} + v_{i,t} - \theta_{i,t}$] has also been tested for robustness but additional terms compared to the standard form in (3) have not been found to be significant.

Appendix III. Empirical Results and Robustness Analysis

		Table A1. Use of Capital				
		Dependent variable: log of employment rate ln(K/Y)				
	(1)	(2)	(3)	(4)	(5)	(6)
Output volatility	-0.63**	-1.23***	-0.60*	-0.77**	-0.76**	-1.37***
	(-1.98)	(-6.79)	(-1.79)	(-2.37)	(-2.44)	(-3.25)
Cost of starting a business 1/	-0.01**	-0.01***	-0.01**		-0.01**	-0.001*
	(-2.15)	(-2.86)	(-2.53)		(-2.28)	(-1.85)
Trade tariffs	-0.47**	-0.57***	-0.47***			-0.69**
	(-2.51)	(-4.20)	(-2.78)			(-2.10)
Private credit to GDP			0.03	0.05**	0.04	0.10**
			(1.33)	(2.05)	(1.48)	(2.56)
Availability of latest technologies				0.02**	0.02*	
				(2.24)	(1.85)	
Constant	1.35***	1.40***	1.32***	1.09***	1.20***	0.44***
	(34.61)	(36.38)	(27.35)	(14.16)	(17.21)	(5.34)
Year effects	Yes	No	Yes	No	No	No
Time trend	No	No	No	Yes	Yes	Yes
Observations	636	592	551	564	551	551
No of countries	59	55	58	58	58	58
Outliers excl. (BLG/GRC/UKR/VEN)	No	Yes	No	No	No	No
R-squared						
within	0.45	0.45	0.52	0.45	0.45	0.24
between	0.12	0.23	0.15	0.16	0.12	0.36
overall	0.12	0.22	0.16	0.17	0.14	0.35
Estimator	RE	RE	RE	RE	RE	RE
Robust errors	Yes	Yes	Yes	Yes	Yes	Yes

Notes: z-statistics in parentheses; *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Regressions include a constant term, year effects, and time trend (not reported here). RE=fixed-effects estimator. See Appendix 1 for the definitions and sources of variables.
1/ Columns (1)–(5): number of procedures; (6): number of days.

Table A2. Use of Labor
Dependent variable: log of employment rate ln(E/WP)

	(1)	(2)	(3)	(4)	(5)	(6)
Output gap	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***
	(9.13)	(8.68)	(10.04)	(9.79)	(8.76)	(9.00)
PMR: regulatory quality	0.05*	0.07***	0.07***	0.05***	0.08***	0.08***
	(1.82)	(2.71)	(3.04)	(2.68)	(4.52)	(4.01)
Share of female in population					-0.04**	-0.03*
					(-2.32)	(-1.67)
Top marginal income&					-0.001**	
payroll tax rate (τ)					(-2.04)	
Tax rate (τ) * tax compliance						-0.0002**
						(-2.14)
Constant	x	4.11***	4.11***	4.04***	6.27***	5.75***
		(186.85)	(144.20)	(133.11)	(7.01)	(5.95)
Year effects	Yes	Yes	No	No	Yes	No
Time trend	No	No	Yes	Yes	No	Yes
Observations	912	864	864	1,140	602	612
No of countries	57	54	54	57	55	57
Outliers excluded (LUX, CYP, VEN)	No	Yes	Yes	No	Yes	No
R-squared						
within	0.33	0.36	0.35	x	0.41	0.39
between	0.11	0.12	0.12	x	0.11	0.07
overall	0.12	0.14	0.14	x	0.13	0.10
Estimator	RE	FE	RE	MG	RE	RE
Robust errors	Yes	Yes	Yes	Yes	Yes	Yes

Notes: z-statistics in parentheses; *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Regressions include a constant term, year effects, and time trend (not reported here). RE=random-effects, FE=fixed-effects, MG=mean group estimator. See Appendix 1 for the definitions and sources of variables.

Table A3. Stochastic Frontier Analysis: A Simple Illustration

Dependent variable: log real GDP-to-labor ratio

Frontier: $ln(Y/L)_{i,t} = \beta_0 + \beta_t t + \beta_1 ln(K/L)_{i,t} + v_{i,t} - u_{i,t}$

Model of inefficiency: $u_{i,t} = z_0 + \gamma_z z_{i,t} + w_{i,t}$

	1980–2016
Frontier	
Log capital-labor ratio	0.54***
	(54.75)
Time trend	0.005***
	(10.28)
Constant	1.20***
	(24.35)
Mean inefficiency	
AE dummy	-1.46***
	(-6.32)
Variance of inefficiency	
EM dummy	1.49***
	(6.70)
Constant	-2.65***
	(-10.78)
Log-likelihood	104
Observations	2,082
Number of countries	59

Notes: z-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
See Appendix 1 for the definitions and sources of variables.

Table A4. Stochastic Frontier Analysis with Conditional Inefficiency Effects

Dependent variable: log real GDP

Frontier: $lnY_{i,t} = \beta_0 + \beta_t t + \beta_L \ln L_{i,t} + \beta_K \ln K_{i,t} + v_{i,t} - u_{i,t}$

Model of inefficiency: $u_{i,t} = z_0 + \gamma_z z_{i,t} + w_{i,t}$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	1980–2016	1996–2013	1996–2013	1996–2013	1996–2013	2006–2015	1996–2013	1996–2013	1996–2013	1996–2013	2006–2013	1996–2013
Frontier												
Log labor	0.31***	0.33***	0.38***	0.39***	0.38***	0.42***	0.39***	0.42***	0.39***	0.25***	0.25***	0.30***
	(24.22)	(46.58)	(30.30)	(32.60)	(28.17)	(22.17)	(23.45)	(30.38)	(21.39)	(14.80)	(13.15)	(30.10)
Log capital	0.65***	0.65***	0.60***	0.60***	0.61***	0.57***	0.59***	0.57***		0.61***	0.50***	
	(50.40)	(85.30)	(48.29)	(51.09)	(45.71)	(29.94)	(35.67)	(40.59)		(36.54)	(26.45)	
Time trend	-0.004***	0.002***	0.003***	0.003***	0.004***		0.005***	0.004***	0.01***	0.003***		0.01***
	(-3.65)	(2.54)	(3.02)	(3.15)	(3.85)		(4.14)	(4.19)	(7.68)	(9.92)		(7.77)
Log private capital									0.45***			0.46***
									(27.86)			(26.77)
Log public capital									0.14***			0.10***
									(9.46)			(9.37)
Log energy use										0.13***	0.22***	0.12***
										(9.63)	(11.64)	(9.61)
Constant	-0.97***	-1.38***	-1.57***	-1.59***	-1.61***	-1.68***	-1.64***	-1.73***	-1.04***	-0.84***	-0.52***	-0.40***
	(-12.43)	(-55.23)	(-36.17)	(-38.78)	(-36.15)	(-31.05)	(-29.49)	(-38.93)	(-12.59)	(-12.02)	(-5.32)	(-7.88)
Mean inefficiency												
PMR: regulatory quality		-0.16***	-0.23***	-0.24***	-0.24***	-0.16***	-0.08***	-0.07**	-0.21***	-0.12***	-0.14***	-0.12***
		(-12.99)	(-11.29)	(-11.30)	(-9.94)	(-7.54)	(-2.61)	(-1.99)	(-5.86)	(-7.82)	(-5.27)	(-7.90)
LMR: CBR_total		0.31***								0.22***		0.18***
		(7.55)								(5.34)		(4.08)
LMR: CBR_working time			0.44***	0.50***	0.44***	0.37***	0.43***	0.66***	0.53***		0.76***	
			(6.41)	(6.01)	(5.78)	(6.94)	(4.77)	(13.00)	(11.49)		(6.45)	
Log change in terms of trade				-0.54***	-0.53***	-0.63***	-0.61***	-0.88***	-0.91***		-0.66***	
				(-3.87)	(-3.48)	(-3.43)	(-3.31)	(-5.04)	(-4.67)		(-3.43)	
Output gap					-0.02***	-0.02***	-0.02***					
					(-4.19)	(-5.63)	(-4.62)					
Cost of starting a business						0.02***						
						(6.49)						
WEF_government effectiveness							-0.15***	-0.20***	0.00			
							(-4.17)	(-4.42)	(0.07)			
EM dummy								0.12***	0.06**		0.08*	
								(3.70)	(2.04)		(1.77)	
PMR: WEF_market dominance											-0.05**	
											(-2.33)	
Constant		0.37***	0.19***	0.16***	0.18***		0.21***			0.39***		0.32***
		(12.11)	(4.03)	(2.85)	(3.33)		(3.34)			(14.30)		(9.63)
Variance of inefficiency												
EM dummy		1.85***	2.35***	2.30***	2.22***	3.22***	2.15***			1.74***		1.54***
		(16.47)	(7.19)	(7.10)	(7.51)	(4.04)	(6.24)			(15.93)		(10.00)
Log change in terms of trade				-4.64***	-2.91***	-7.98***	-2.31**	-6.32***	-6.97***		-6.82***	
				(-4.27)	(-3.08)	(-4.82)	(-2.33)	(-4.78)	(-4.44)		(-4.41)	
Political stability								-0.84***	-0.96***			
								(-7.70)	(-7.73)			
Constant		-4.15***	-4.86***	-4.77***	-4.77***	-5.79***	-4.88***	-2.90***	-3.22***	-4.23***	-3.15***	-4.23***
		(-50.62)	(-14.35)	(-14.10)	(-15.39)	(-7.27)	(-13.66)	(-27.98)	(-24.89)	(-55.42)	(-17.88)	(-37.97)
Log-likelihood	1,629	278	282	296	318	182	285	275	359	318	199	416
Observations	2,082	1,040	1,038	1,036	972	437	820	866	866	1,013	451	1,013
Number of countries	59	57	57	57	55	55	55	57	57	56	56	56

Notes: z-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1. See Appendix 1 for the definitions and sources of variables.

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LABOR MARKET INFORMALITY IN ARGENTINA: EVOLUTION, INCENTIVES, AND POLICIES[1]

A. Introduction

1.   Informality is a key feature of the Argentine labor market. After reaching a peak in the early 2000s, the share of informal workers (those working but not contributing to social security) has fallen back to the 1990's average level, but at between 30 and 40 percent is still high. These individuals work either for formal firms under informal labor agreements, for unregistered firms that systematically operate at the margin of regulations, or they work on their own without registering and making contributions.

2.   A structural reduction in Argentine informality could increase productivity and fiscal revenues. Although it represents a source of jobs for many who would be otherwise inactive, there is plenty of evidence that firms in the formal sector are able to operate with a higher physical capital stock, better technology, and a higher level of human capital than those in informal sector, which would ultimately result in a more productive economy (Bailey et al, 2005; Dabla-Norris and Inchauste, 2008; Farrell, 2004; La Porta and Shleifer, 2008; Perry and others, 2007, OECD, 2017). Workers currently in the informal sector would also be able to contribute their fair share of the fiscal burden to support the desired level of fiscal spending if adequately integrated into the formal sector (Bour and Susmel 2000).

3.   In this paper, we explore the nature of informality in the Argentine economy, and discuss policies that could help reduce it. Using household survey and official labor statistics in Argentina we identify which group of individuals are most exposed to informality. Second, we review the role played by a few factors in affecting the degree of informality (including labor regulations and the tax wedge on labor income, among others). Third, we use a general equilibrium model, partly estimated and partly calibrated to Argentina, to explore the effects that policy changes could have on informality over time.

4.   We find that informality reflects lack of access to quality education, rigid labor market institutions, and excessive taxation of formal labor. Individuals with a lower level of human capital accumulation have markedly higher degrees of informality. Significant firing costs (from high severance payments, litigation risks, and losses associated to labor strikes) and high minimum wages reduce the demand for low-skilled individuals in the formal sector. The high tax wedge (reflecting elevated social security contributions) and generous non-contributory benefits undercut incentives for working in formal sector. High taxation and rigid labor regulation on formal employment also creates incentives for evasion that are only partly offset by enforcement efforts.

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5.   A comprehensive policy package is required to permanently reduce the degree of informality in the Argentine labor market. Such package would need to include policies that i) encourage and facilitate the buildup of human capital and increase the share of individuals with high education and operational and technical skills; ii) reduce the tax burden on formal workers, at least for low-productivity ones, iii) reduce the after-tax minimum wages, and iv) lower firing costs in the formal sector by reducing the uncertainty associated with labor litigation, unrest, and stoppages following warranted dismissals, and reducing severance payments to levels similar to those in other emerging markets.

B. Patterns of Informality

6.   In this section, we explore the patterns of informality in Argentina using micro data and official statistics. We explore first the level of informality, then move to its composition, analyze the degree of informality of selected groups of individuals, present new econometric evidence linking individual characteristics to formality status in the labor market, and compute transition probabilities in and out of informality using household survey data.

Level of informality

7.   Labor market informality in Argentina stands in the 30-40 percent range.

- *Urban informality*: Based on data from the household survey ("Encuesta permanente de hogares"), in the first quarter of 2017 urban informality in Argentina stood at about 32 percent for employees, and 52 percent for self-employed.[2] Urban informality has declined by 10–15 percentage points from its high levels after the 2001 crisis, but it has remained relatively stable in the last decade or so (Chart).

Urban informality of dependent and independent workers

- Nationwide (urban and rural) informality: Combining statistics on informality from the national accounts, employment data from the Ministry of Labor, social security records from the social security administration (ANSES), and the household survey, we estimate that nationwide informality for both employees and self-employed was about

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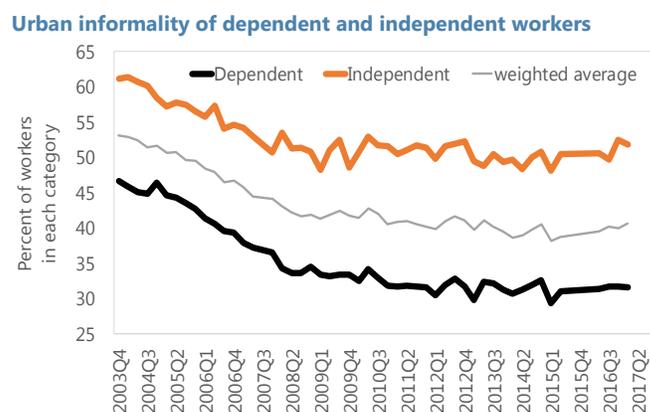
[2]In this paper, informal employees are those Argentines between the ages of 19 and 65 that reported as being employed as dependents and are not paying social security contributions. Informal self-employed are those Argentines in the same age bracket that reported independent work and do not have health insurance (as these individuals are not asked the broader question of whether they are paying social security contributions).

40 percent as of early 2017 (Chart).[3] This reflects a 30 percent informality for employees, that rises to 38 percent if we only consider the private sector. Sectors with high degree of informality include household services (70 percent informality), agriculture (61 percent), and construction (52 percent). The nationwide informality rate is significantly higher for self-employed, at close to 60 percent.[4]

Nationwide Informality
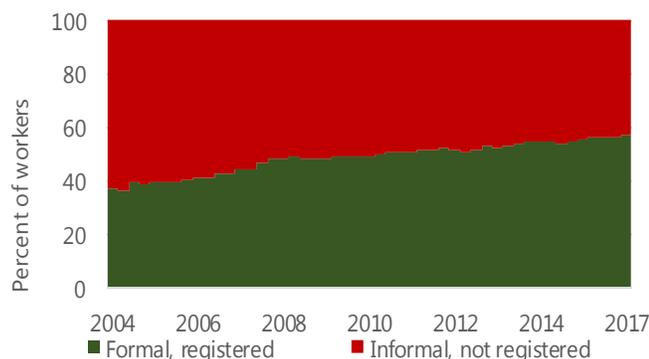
8. **Argentina's level of informality ranks close to the median of Latin American countries.** Cross-country comparisons are difficult given the wide dispersion in methodologies, coverage, and strategies for computing measures of informality. The Socio-Economic Database for Latin America and the Caribbean (SEDLAC) provides measures of informality computed from household survey data in many Latin American countries, and shows that in 2014 Argentina's level of informality was lower than that of Peru but significantly higher than those in Chile or Uruguay (Chart).[5]

Informality in Latin America
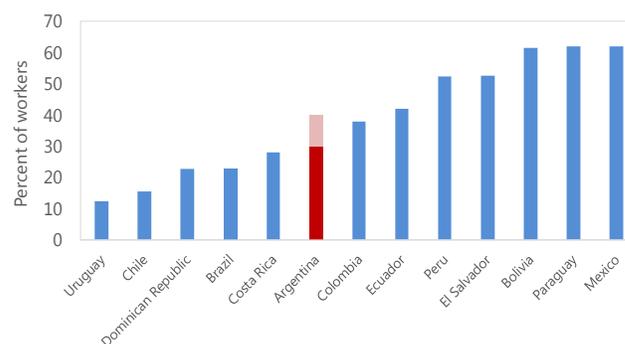
The shaded area in Argentina denotes the 30-40 percent range of informality.

Composition of urban informality

9. **Urban informality is higher for less educated, young, and women**. Based on Household Survey data a few individual characteristics can be associated to being in Argentina's informal labor market (Chart):

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[3] See also Forlac (2014b). These figures are consistent with the recently released national accounts data on formal and informal employment for 2017Q2.

[4] Medina and Schneider (2017) and Schneider (2005) use indirect methods to measure overall informality across the world, and their estimates for Argentina are between 20.8 and 27.2 percent.

[5] Comparisons with other regions is limited by data availability. The ILO database on informality, for example, has data for 16 countries outside Latin America in 2014. The Argentine informality is 4 percentage points lower than the average of those countries.

- **_Education._** The incidence of urban informality in Argentina is much larger for individuals with low human capital. About 50 percent of the informal workers have no education (above primary school level) and about 60 percent report no technical, operative, or professional skills. By contrast, the share of formal workers with no primary or above education attainment and no declared technical, operative, or professional skill is only 16.5 percent.

- **_Age._** Young individuals tend to have a much higher level of informality, with 50-60 percent of those aged between 19 and 24 working in the informal sector in 2017. A 7-percentage-point decline in labor force participation for the young also took place between 2003 and early 2017.

- **_Gender._** Women tend to experience higher labor informality than men (with 33 percent of working women operating in informal sector against 31 percent or men).[6] The gender gap in the labor market however is bigger when looking at the labor force participation, which in 2017 was 95 percent for men and 67 percent for women.

Urban Informality by selected groups
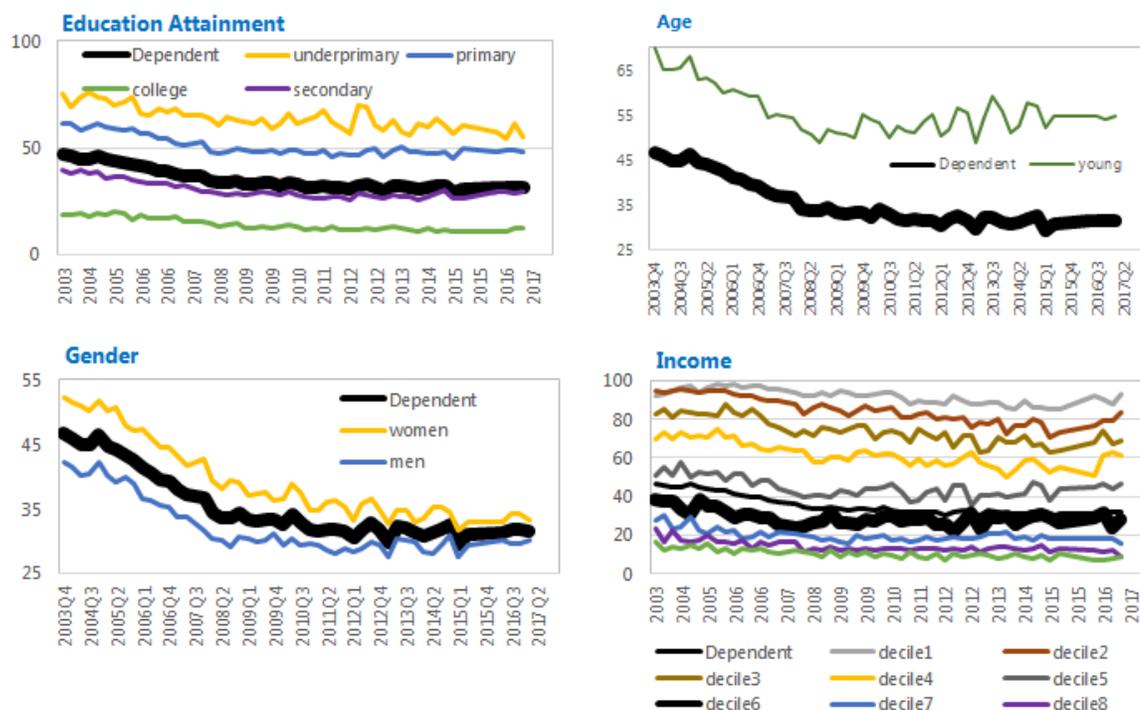
Sources: INDEC's permanent household survey and IMF staff estimates.
Computed for Argentine population in the ages 19-64.

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[6] For the age group in the official labor force statistics (starting at 10 years old), the gender gap is greater, with informality for men at 34 and that for women at 39 (Kolovich, Malta, and Mendes Tavares, 2017).

- **Income.** The informal sector has a greater share of low-income individuals**.** More than 70 percent of informal workers earn a remuneration below the median, compared to 16 percent of formal workers.

Econometric Analysis and Transition Densities Using Micro Data

10.   **Econometric analysis confirms the relevance of education, age, and gender as key characteristics of informal workers.** Using data from the household survey we estimate (through logit regressions) the likelihood of being in the informal labor market for an average Argentine, linking it to the dimensions discussed above (Table 1). We find that low education tends to be the most important determinant of this probability, followed by the young age and, to a smaller degree, being a woman. Being in a couple relationship tends to lower the likelihood of being informal, especially for those that are married. These results and their relative strength are robust to the choice of subperiods and inclusion (or not) of time dummies.

Table 1. Logit Regression on Informality of Key Individual Characteristics[1]				
	2004-2016	2004-2007	2008-2015	2016-2017
undereducated [2]	1.363***	1.421***	1.340***	1.324***
young [3]	0.887***	0.900***	0.874***	0.937***
woman	0.536***	0.634***	0.509***	0.401***
in unmarried couple	-0.110***	0.0193***	-0.142***	-0.235***
in married couple	-0.706***	-0.656***	-0.725***	-0.747***
constant	-0.802***	-0.920***	-1.278***	-1.352***
Observations	386,924,835	110,306,864	235,574,435	57,431,697
Pseudo R-squared	0.1171	0.1219	0.1081	0.1028
Time dummies	Yes	Yes	Yes	Yes

[1] For the able working age population between ages 18 and 65. Excludes students, disabled individuals, and retirees.
[2] Below high school degree.
[3] Between 19 and 25 years old.
*** significant at the 1 percent level.

11.   **Education and skills also affect the probability of transitioning in and out of formality.** We compute these probabilities by forming a panel from the household survey, which track for 8 quarters any given household and its members for the whole sample 2003Q4-2017Q1 (Table 2). The results show that the probability of moving out of informality and becoming a formal worker is relatively small for low educated, older, and female informal workers (chart). The transition probabilities estimated above suggest that while on average

individuals spend 21 years working in the formal sector, important differences exist in terms of i) gender (with men likely to work in the formal sector for a total of 26 years, while women only 18 years) and ii) educational attainment (those with no education are likely to work 9 years in the formal sector, which increases up to 16 years those for those who finish primary school and up to 25 years for those with high-school degree and 32 for those with a college degree).[7]

Table 2. Transition Probability Matrix Across Employment States

From\To		1	2	3	4	5	6	7	
Dependent									
1	Informal	64	12	6	3	1	6	9	100
2	Formal	5	91	1	1	1	1	2	100
Independent									
3	Informal	16	3	57	7	5	5	7	100
4	Formal	9	6	9	57	9	3	8	100
5	**Owner**	7	7	12	16	54	1	3	100
6	**Unemployed**	26	9	8	3	1	32	22	100
7	**Inactive**	10	3	3	3	1	6	75	100

Probability of a dependent informal worker of transitioning into another employment state
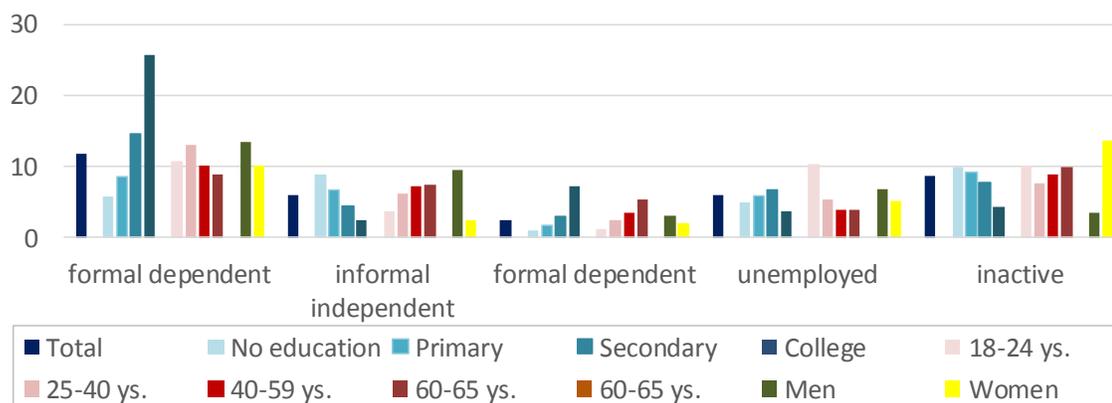
C. Factors Affecting Informality

12.   Policies can influence the incentives that drive decisions on informality by firms and workers. The levers include changes in labor taxation, public investment in human capital formation, regulations affecting i) hiring and firing costs, ii) firm entry, and iii) minimum wages,

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[7] Bertranou and Sanchez (2003) show that contribution density (the share of months when contributions are made) fell to 39 from 54 percent during 1994 and 2001, and increased with wage level, size of firm, and age during the period. Rofman and Oliveri (2009) show that 60 percent of the population would not be able to make enough contributions to qualify for a contributory pension. Apella (2010) also concludes that less than half of those registered with social security contribute for more than 30 years and thus earn a contributive pension above the minimum. Bosch and Maloney (2010) estimated that workers in Argentina tend to remain 5 years in the formal sector, 1 year in the informal sector as salaried workers, two years as informal self-employed, less than a year as unemployed and two years as unemployed, whenever they land in each of those states.

as well as enforcement of labor taxation and regulations. In practice, the Latin American countries that have tried to reduce informality have used different combinations of these policies. Box 1 highlights some of the key aspects of the strategies followed by Argentina, Chile, Colombia, Peru, and Uruguay over the past decades to successfully reduce informality.

High labor taxation

13.   A high labor tax wedge may discourage participation into the formal sector. A sufficiently high taxation on labor could reduce the demand for low-skilled labor. Unskilled workers may also find that the taxes and contributions they need to pay if engaging in formal work relations do not correspond to the benefits and quality of services they expect to receive, and could decide to opt out of formal institutions (Perry at al 2007). The literature has explored avenues through which higher labor taxes create incentives for informality (Loayza, 2006 and 2016; de Soto, 1989; Melguizo and Gonzales-Paramo, 2012). Nevertheless, empirical evidence of the link between tax wedge and informality has been difficult to establish, although the relationship is more apparent for low-income individuals (OECD/IDB/CIAT (2016).[8] In Colombia, the most recent Latin American experience with a major reduction in labor taxes, the 13.5 percentage point reduction in employer social security contributions in 2012 has been associated to a 1-2 percentage point reduction in informality (Box 1).

14.   In Argentina, the tax and transfer system may act as a disincentive to work in formal employment. As described in OECD (2016) and Dudine et al (2017), the average *tax wedge on labor* (difference between cost of labor and take-home pay after considering taxes and cash benefits) is quite high. Almost all can be attributed to social security contributions (SSC), among the highest in the region and close to OECD levels. By contrast, owing to generous deductions and relatively low non-taxable minimum income, personal income tax is paid only by those in the 90-percentile of the income distribution. Using data from the Household Survey, Dudine et al (2017) compute the *net formalization cost* (the difference between taxes to pay, benefits received, and benefits lost if becoming formal, as share of the personal or household pre-formalization net income) for a few representative types of household and across the income distribution. The result show that the net formalization cost for the employee tends to be higher for low-wage workers and second earners in

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[8] Banerji and others (2017) note that theoretically the fiscal policy reaction function matters for the impact on of lower labor taxes on the economy. In particular, the way in which other taxes or government spending react to lower labor tax rates is crucial for the final effect on employment and activity. In simulations for advanced economies, they conclude that accompanying the reduction in labor taxes with lower lump sum transfers has a positive impact on the economy, but the same reduction in labor taxes will have a detrimental effect on potential output if accompanied by lower public investment (Banerji and others 2017)

Box 1. Reducing Informality in Latin America: Lessons from Previous Episodes

A few countries in Latin America, including Argentina, have successfully reduced informality. Colombia and Peru started from higher levels of informality while Chile and Uruguay started from lower levels of informality than those currently prevailing in Argentina. These experiences have in common a favorable context in terms of the business cycle and generally good macroeconomic policies, accompanied by specific policy measures that improved business conditions for firms and made directly promoted formal employment.

Argentina. Informality fell to 33 percent from 50 percent between 2003 and 2014 Earlier work by Bertraneou, Casanova, and Saravia (2010), Bour and Susmel (2010), and Forlac (2014a and 2014e), we suggest this was the result of a series of factors. First, the strong output growth in the period helped reduce the rate of unemployment from the post crisis peak to early 1990s levels. Second, enforcement of labor regulations, which had been significantly relaxed in the 1990s, was tightened and modernized. Third, the public sector became a strong supplier of formal jobs, with a significant increase in the public-sector labor force. Fourth, explicit policy initiatives contributed to the decline in informality, such as the 33 percent reduction in contribution rates in firms with less than 25 employees for new hires up to a year and better implementation of a simplified tax system for independent workers ("monotributos") and for domestic workers introduced in the late 1990s, among others.

Chile. Between 2009 and 2013, Chile lowered labor informality to 15.5 from 22 percent. FORLAC (2014a, 2014c) attributes this decline partly to a reduction in the cost of compliance by simplifying regulations and procedures, including Chile's Law to Facilitate Procedures and the "Your Business in One Day" program.

Colombia. Between 2009 and 2014, Colombia lowered labor informality to 38 from 44 percent. FORLAC (2014a, 2014d) attributes the decline to the strong position in the business cycle, as well as a reduction in costs of compliance with regulations by simplifying administrative procedures and explicit programs to increase the formalization in the labor market, including "Colombia becomes formal." In addition, a tax reform in 2012 lowered payroll taxes from 38 percent to about 24.5 percent. The structural tax reform of 2016 simplified the tax system reducing the cost of tax compliance, raised corporate income taxes, and strengthened tax administration by severely increasing penalties for tax evasion including up to 9 years in prison. The latter tax reform is credited with reducing informality by 1.2 to 2.2 percentage points (Fernandez and Villar, 2016; OECD, 2017), and increasing formal employment by 4-5 percent (Kugler and Kugler, 2017).

Peru. Between 2005 and 2014, Peru gradually reduced labor informality to 52 from 70 percent. FORLAC (2014a, 2014e) attributes the decline to favorable business cycle conditions associated to high commodity prices and good polices, direct tax incentives for the formalization of firms and jobs, tools for better enforcement, including the creation of e-payroll, and an increase in the size of the modern sector of the economy that tends to be formal.

Uruguay. Between 2007 and 2014, Uruguay lowered informality to 12.5 percent from 22.1 percent. FORLAC (2014a, 2014f) attributes the decline to strong growth of the economy in the context of good macroeconomic policies, as well as reforms in the social security system that significantly increased the benefits of formality (reducing the tax component of contributions) as well investment promotion regulations favoring investments with job creation. It also reduced costs of formalization by adopting a single-tax rate to [independent workers] that simplified compliance with regulations at the level of firms.

families where the other partner already works in the formal sector. For the employer, it averages about 24 percent of the gross wage before formalization (see Dudine et al 2017 for more details).

15.   The formalization cost is particularly high for low skills workers who are unlikely to contribute for long periods of time. In principle, at least part of the contributions paid in formal employment relations can be viewed as an advanced payment for the stream of benefits that workers receive over their lifetime, including retirement pensions, and not as a tax. However, in calculating the true tax component of the social security contributions, we need to net out those non-contributory benefits that workers would receive anyway by remaining in the informal sector (such as the "*Pension Universal para el Adulto Mayor*" introduced in 2016). In Argentina, in order to receive a contributory pension above the minimum, workers need to contribute for 30 years (see SIP 2016). The labor transition probabilities estimated in this paper suggest however that only 25 percent of the labor force, primarily those with college degrees, manage to contribute for this long.[9] This suggests that for many of those in the informal sector, particularly with a low education level, social security contributions are likely to be seen as "pure taxes".

16.   Reducing informality in Argentina would thus require lowering the tax wedge on labor, especially for those that have higher probability to be informal. Dudine et al 2017 discuss a few measures that could reduce the tax wedge by about 8 percentage points, on average, and by 15 percentage points for the bottom decile of the income distribution, including reducing SSCs for retirement benefits to 10 percent for both the employer and the employees, expanding the coverage of the personal income tax at the top of the income distribution, and expanding income support for the poorest while phasing it off at the medium wage. These measures would also reduce the formalization costs for the employer, by about 6 percentage points on average across all employers.

Low human capital formation

17.   There is ample evidence that informality sharply decreases with education. Countries with high informality tend to have larger shares of individuals that have not completed high school and higher degrees of illiteracy. Formal firms in these environments face shortages of qualified labor, while at same time large shares of the population are seeking and cannot find a formal job. Galiani and Weinschelbaum (2007) and FORLAC (2014a) found that informality decreases sharply with the degree of educational achievement, controlling for other individual characteristics. Factors that affect informality are particularly binding at low education and skill levels, and for young individuals without much job experience. This

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[9] In comparison, over 63 percent of current retirement benefits have been extended under pension moratoria, confirming that, historically, only about one third of people in retirement age meet the contribution requirements necessary to access the contributory pension.

suggests shortages of labor demand at low-skill, -education, and -experience levels at prevailing wage levels in the formal sector (OECD, 2017).

18.   While human capital formation in Argentina has improved over the last fifteen years, important challenges remain. The share of individuals completing secondary school rose to 43.5 from 34.9 percent between 2003 and 2017 (chart). Similarly, the share of individuals with college degrees rose to 24.3 from 18.8 percent during the same period. However, educational attainment remains low in international comparison, and improved less than in other countries, including in the region (Unesco, 2013, OECD, 2017). Only 73 percent of children aged 3 to 5 were enrolled compared to 86 percent in OECD countries. Expanding early education would not only improve the equality of opportunities, especially for children from disadvantaged background, but would also facilitate greater female participation in the labor market. Half of students enrolling for an upper secondary degree leave school without finishing the degree, and less than two fifths of Argentinians of age 25-34 have received some education at college, university or a higher level technical school (OECD, 2017). There is significant scope for improving active labor market policies, such as training and job counselling, and making them more effective in helping Argentinians to gain employment (OECD, 2017).

Population structure by educational attainment: 2003-2017Q1
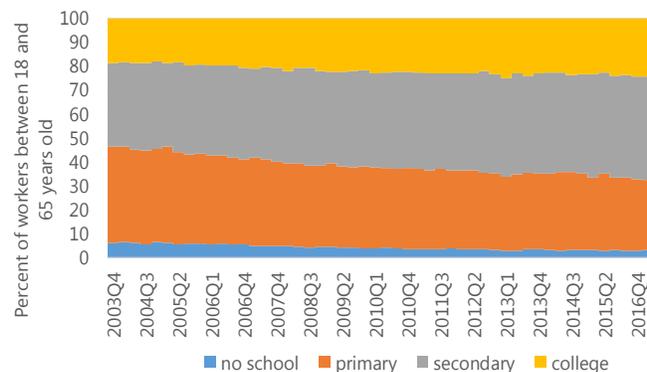
High hiring and firing costs

19.   Higher hiring and firing costs in the formal sector (relative to the informal sector) reduce labor demand in the formal sector and increase informality. Higher hiring and firing costs reduce the total number and turnover of workers in any given firm, as it becomes expensive to replace workers. Such lower rotation has its benefits too in that it preserves human capital specific to the firm during temporary cyclical disruptions in economic activity, but in excess, it would lead to the replacement of labor for capital and may lead to shortages in formal labor demand (Bosh and others, 2017; Munkacsi and Saxegaard, 2017). In describing the effects of the Colombian reduction in firing costs in the 1990s, Kugler (1999) acknowledges an increase in the labor destruction rate, but argue that this allowed a reduction in unemployment through an increase in the hiring rate. In analyzing the effect of the 1988 constitutional increases in firing costs in Brazil, Bosch and others (2012) find empirical evidence that they contributed to increasing informality. Recent research at the IMF suggests the effect on formal economic activity of lowering firing costs depend on business cycle conditions. Lowering firing costs tend to have positive effects on the economy during good times, but

tend to have output costs during bad times. One of the reasons is that as they may have fiscal implications that affect the economy through multiplier effects (Banerji and others, 2017; Duval, Romain, Davide Furceri and others, 2016; Cacciatore, Duval, and others, 2017).

20.   Argentina has one of the tightest labor protection arrangements in Latin America and the emerging markets, close to the level of those in OECD economies. The aggregate employment protection index, computed by the OECD and expanded to Latin America in cooperation with the Interamerican Development Bank (IDB), is significantly larger than those computed for its closest trading partners, i.e. Brazil and Chile (chart). Argentina's labor

protection legislation imposes and high termination costs, complex procedures for collective dismissals, and restrictive conditions for temporary employment (including part-time work and apprenticeship). Argentina is an outlier with respect to severance payments at 4 and 20 years and even more after 9 months. The maximum time allowed to make a claim of unfair dismissal is also comparatively extremely long, which unduly exposes firms to contingent litigation risks. In the case of

Employment protection index

Sources: OECD and Interamerican Development Bank.

collective dismissals, the operational definition is extremely restrictive, and the administrative process of notification is more onerous than elsewhere. High firing costs imply that most of the adjustment in the labor market takes place on the hiring front. Data from the Ministry of Labor suggests that firing rates (labor destruction) are very stable over time, probably reflecting normal attrition, except during periods of significant stress, such as during the global financial crisis. On the other hand, hiring rates move with the business cycle, although the relationship weakened after the global financial crisis.

High firm entry costs

21.   Product market regulation increases entry costs for formal firms and tends to reduce formal employment, leading to higher informality. The higher entry costs tend to reduce the number of formal firms operating in the market, and hence their aggregate demand for labor. They raise the net present value of profits that in equilibrium is required to operate a formal firm, excluding from the market other less profitable firms that would generate employment and still cover their economic operating cost (Munkacsi and Saxegaard, 2017).

22.   Argentina ranks poorly in terms of product market regulation. For example, barriers to entrepreneurship are high and regulatory procedures are complex (Lusinyan, 2017, OECD, 2017). Product market regulation can lead to informality, even without minimum wage regulation or strict bargaining power, as shown by Galiani and Weinschelbaum (2007). These costs may be too high to be covered with limited entrepreneurial capacity and hiring individuals with low productivity, and lead naturally to low-productivity individuals gravitating towards the informal sector, and high-productivity individuals toward the formal sector.

Minimum wages

23.   Minimum wages contribute to informality of low productivity workers. Low skills workers may find difficult to find a formal job if minimum wages exceed their labor productivity. These individuals would not be able to get a formal job even in the absence of taxes or other levies on labor contracts at the prevailing minimum wages. In countries where the labor tax wedge is large and minimum wages are high, it is possible to reduce informality by reducing after-tax minimum wages for individuals with low human capital. The burdens on the labor market are divided between workers and employers based on their negotiating power, and ultimately, elasticity of demand. Nataraj and others (2014) conclude that higher minimum wages in low income countries are associated with lower formal employment and a higher share of informal workers, especially for unskilled and female workers. IMF and G20 work (IMF, 2016; Jaumotte and Osorio, 2015;) have noted a wide cross-country dispersion in the ratio of minimum to median wages in the range of 25-50, and found some evidence of macroeconomic benefits of the ratio being within the 30–40 percent range.

24.   In Argentina, although minimum wages are not particularly high compared to other countries when expressed in percent of median wages, they are still binding for a large number of low skilled individuals.[10] By the first quarter of 2017, the minimum wage was at 46 percent of the median wage. This is within the range prevailing in many countries in Europe, and lower than in Chile, Colombia, and Costa Rica, according to the OECD (chart). Nevertheless, more than 45 percent of informal workers in Argentina earn less than the minimum wage. This indicates

Simplified Kaitz Ratio: 2015

(Ratio of minimum to median wages of full-time workers)
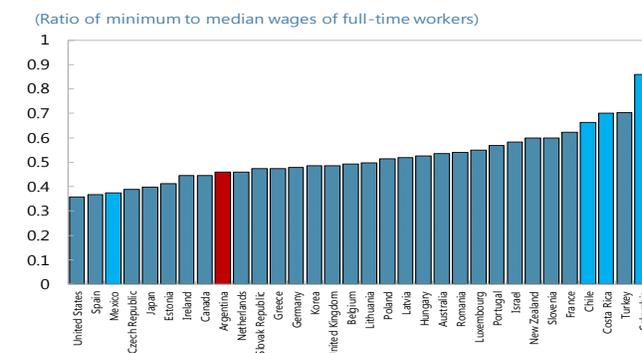
Sources: OECD, INDEC (Permanent household survey), and IMF staff estimates.

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[10] Minimum wages in Argentina, to a significant extent, reflect the outcome of collective bargaining agreements. Each collective bargaining agreement establishes its own minimum wage which is often twice the legal minimum wage, but typically reflects differences in skills. A legal minimum wage for the country is then negotiated between the government and the unions. If no agreement is set, the government can set the minimum wage that applies for the country establishing a floor on the wage level in the formal sector.

that a significant share of workers in the informal sector earn less than what would be legally permissible in the formal sector. They may work in the informal sector because they cannot afford to pay the formalization cost or because they could not find a job in the formal sector at the legal minimum wage, or because they could not find a formal job with the flexibility required, for instance, by women with small children.

Weak enforcement

25.   Weak enforcement of taxes and regulations leads to a high degree of informality. The degree of enforcement affects the level and composition of informality. Informality tends to be higher when a high tax and regulatory burden is associated with low penalties and small probabilities of being caught when not complying (Galiani and Weinschelbaum, 2007, Schneider 2012). Large firms and high income individuals are easy to monitor and sanction in the event they deviate from the tax and labor obligations. So are firms that conduct large-scale international trade, as they need to go through formal procedures and customs. These firms and individuals tend to have low rates of informality. In contrast, small firms and many low-income individuals are difficult to monitor and the penalties imposed are unlikely to cover the cost of monitoring and enforcement. Perry and others (2007) find econometric evidence that weak enforcement was a factor explaining the high levels of informality in Argentina, Bolivia, and the Dominican Republic. Efforts at better enforcing taxes and labor regulations, including by reducing compliance costs, have helped reduce informality in many Latin American countries including Argentina (Box 1).

26.   There is scope for further improving the enforcement of labor taxation and regulations. An amnesty for formalizing informal labor arrangements could be justified if followed by higher penalties for labor violations and a strengthening of the entities in charge of labor inspection at the federal and provincial levels to align their incentives for enforcement (Amengual, 2014). The increased intensity in labor inspections could be better publicized through annual reports on labor inspections and providing time series of the results of labor inspections. Investments in electronic inspection technology could help increase the productivity of labor inspectors.

Expanded econometric analysis

27.   We found that labor taxation and minimum wages empirically matter for defining the degree of informality. We expand the earlier econometric analysis with some of the factors that affect informality as described above. In particular, we add the ratio of individual wages to the prevailing legal minimum wage, and the social security contribution rate of employees, together with the unemployment rate and economy-wide average real wage as controls. Two findings are worth highlighting. First, the ratio of individual to minimum wages strongly matters for informality (the negative sign suggests that individuals who earn more tend to be less informal, but could also suggest that an increase in the minimum wage would increase informality). Second, an increase in the contribution rate of employees tends to increase the rate of informality. The results suggest that lowering employee contribution rates

by 13.5 percentage points, like the amount of the reduction in employer's contributions that took place in Colombia in 2012, would reduce Argentine informality by 2.7 percentage points (slightly higher than the decline attributed to the reform in Colombia). In addition, they suggest that lowering the minimum wage to median wage ratio from 45 to 35 percent would lower informality by 1.2 percentage points.

Table 3. Expanded Logit Regressions on Informality[1]			
Sample	2004-2016	2004-2007	2008-2015	2004-2007 2016-2017
undereducated [2]	0.742***	0.781***	0.736***	0.748***
young [3]	0.414***	0.428***	0.414***	0.414***
woman	-0.118***	0.0130***	-0.149***	-0.0713***
in unmarried couple	0.0226***	0.124***	-0.00310***	0.0639***
in married couple	-0.481***	-0.418***	-0.517***	-0.428***
Wages to minimum wage	-1.887***	-1.859***	-1.868***	-1.917***
real wage economy wide	0.00566***	-0.0135***	0.0288***	-0.0136***
unemployment rate	0.131***	0.117***	0.194***	0.0919***
Employee contribution rate	0.201***	0.196***	0.212***	0.0402***
constant	-0.984***	-0.140***	-3.920***	1.478***
Observations	335,201,869	99,629,366	204,761,179	130,440,690
Pseudo R-squared	0.1171	0.1219	0.1081	0.1028
Time dummies	Yes	Yes	Yes	Yes

[1] For the able working age population between ages 18 and 65. Excludes students, disabled individuals, and retirees.

[2] Below high school degree.

[3] Between 19 and 25 years old

*** significant at the one percent level.

D.   Policies to Reduce Informality: Dynamic General Equilibrium Model Simulations

28.   To study the interaction of some of the recommended policies, we use a dynamic general equilibrium model with an informal labor and product market. The base model (Anand and Khera, 2016; Munkacsi and Saxegaard, 2017), which has been calibrated and estimated with Argentine data (Canales-Kriljenko, Munkacsi, and Dudine, forthcoming), is a perfect foresight dynamic general equilibrium model that formalizes households and firms'

decisions, including that of being in the formal or informal sector (Levine and others, 2010). Formal firms enjoy more stability, face a larger market, and can accumulate a larger stock of capital that makes labor more productive. On the other hand, they pay taxes, face higher bargaining power from workers, and have higher labor hiring and entry costs. Households who work in the formal sector earn higher pre-tax wages, owing to both greater labor productivity and bargaining power, and face a lower probability of being fired, but pay labor income taxes and social security contributions (although they still earn higher after-tax wages).

29.   The model's steady-state can be used to illustrate the incentives at work for informality. For the simulations, we use a version of the model partly calibrated and partly estimated through Bayesian methods using quarterly data on the Argentine economy. As a result, labor market turnover is much lower in the formal sector, reflecting lower hiring and firing probabilities (Table 4). Similarly, the exit rate of firms, that is, the number of firms that close each period, is significantly lower in the formal sector, with the exit rate in the formal sector calibrated from official statistics on firm turnover. In the model, formal firms have almost twice the capital stock per workers and a labor productivity that is almost 40 percent higher than that of informal firms, which allows them to pay wages that are almost three times greater than in the informal sector (even if formal firms use the same technology than informal firms do). With these incentives, the degree of informality in the economy is 32 percent, the unemployment rate is 8.6 percent, while the investment rate is about 19 percent, all similar to October 2017 values.

Table 4. Incentives for Informality in Model Steady State

	Formal	Informal	Difference
Labor market dynamics			
Probability of hiring workers	0.158	0.625	-
Probability of firing workers	0.100	0.848	-
Product market dynamics			
retailers exit rate	0.026	0.173	-
Sources of demand			
Exports	0.887	0.000	+
Government consumption	0.540	0.000	+
Investment for physical capital production	0.211	0.000	+
Output technology			
Output	3.295	1.104	+
Total factor productivity	1.000	1.000	-
Capital stock parameter	0.501	0.500	+
Capital Stock	17.333	4.185	+
Employment	0.623	0.291	+
Capital per employee	27.813	14.368	+
labor productivity	5.288	3.790	+
Income			
After tax labor income	2.819	1.104	+
Burdens of formality			
Tax rate on labor on employees	0.140	0.000	+
Tax rate on labor on employers	0.210	0.000	+
Workers bargaining power over wages	0.736	0.100	+
Entrepreneurs labor hiring costs	0.979	0.158	+
retailers entry cost	4.846	2.000	+

Source: Fund staff estimates.

**30.   The model suggests that reducing informality would require a package of measures.** We simulate the impact of policy changes that reduce (by 10 percent), i) taxes and social security contributions by both employees and employers, ii) the bargaining power of

workers in the formal sector, iii) formal firms' entry costs, and v) formal firms' hiring costs. Taken in isolation, all measures reduce informality over the first five years, even if the effect is small. The simulations also illustrate how a package of reforms can effectively reduce informality over the medium term. In particular, a simultaneous 10 percent reduction in labor taxes, bargaining power of workers, formal firm entry costs, and formal sector labor hiring costs can result in higher output, lower unemployment, and a 2-percentage point reduction in informality relative to the baseline over the first five years. As time increases, the impact on economic activity and unemployment continue to strengthen, although the gains on informality tend to diminish as the increase in aggregate demand spillovers also onto the informal sector, requiring an increase in the amount of labor employed in the informal sector.

Simulation of Package of Labor Reforms

Informality, PA [Percent of Employment]

Unemployment rate, PA [Percent of labor force]

Real GDP [2018Q1=100]

Total employment [2018Q1=100]

Annex I. STRESS Model Structure

1.   Representative household Utility function

A representative infinitely living household with perfect foresight consumes over time a bundle of formal, informal, and foreign goods. It maximizes expected discounted lifetime utility of consumption ($\max E_0 \sum_{t=0}^{\infty} \beta^t \zeta_{C,t} U[C_t]$), where the contemporaneous utility is given by

$U[C_t] = (1-hc)ln(C_t - C_{t-1})$. β is the discount factor, $\zeta_{C,t}$ is the preference shock and $hc \in (0,1)$

is the external consumption habit parameter. In turn, the aggregate consumption bundle C_t

consists of home-produced goods $C_{H,t}$ and foreign-produced (imported) goods $C_{f,t}$,

$$C_t = \left[\alpha^{\frac{1}{\eta}} C_{H,t}^{\frac{\eta-1}{\eta}} + (1-\alpha)^{\frac{1}{\eta}} C_{f,t}^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}}$$ where $\alpha \in (0,1)$ and $\eta > 0$ is the elasticity of substitution

between home and foreign produced goods. In turn, the home consumption $C_{H,t}$ is also a

composite of goods produced in the formal sector $C_{F,t}$ and goods produced in the informal sector

$$C_{I,t}: C_{H,t} = \left[\omega^{\frac{1}{\mu}} C_{F,t}^{\frac{\mu-1}{\mu}} + (1-\omega)^{\frac{1}{\mu}} C_{I,t}^{\frac{\mu-1}{\mu}} \right]^{\frac{\mu}{\mu-1}}$$, where $\omega \in (0,1)$ represents the weight of formal sector

goods in the basket, and $\mu > 0$ is the elasticity of substitution between sectoral goods.

2.   Household budget constraint

The household earns labor income from working in the formal sector ($L_{F,t}$) or in the informal sector

($L_{I,t}$), or it receives social benefits WU_t , which is an exogenous shock, if it is unemployed. WF_t and

WI_t are the sectoral real wages; although only the formal sector's wage is subject to income

$\tau_{Femployee,t}$ which is an exogenous variable. $Y_{HP,t}$ denotes home production.

The household's income also includes profits from wholesaler and retailer firms, denoted by W and R, respectively. The number of retailer firms is endogenous, while the number of wholesaler firms is normalized to one. The household pays for the entry costs ($entry_{F,t}$ and $entry_{I,t}$) of new firms $N_{F,t}^E$ and $N_{I,t}^E$.

The laws of motion for the retail firms are
$$N_{F,t} = (1 - \delta_{F,t})(N_{F,t-1} + N_{F,t}^E)$$
$$N_{I,t} = (1 - \delta_{I,t})(N_{I,t-1} + N_{I,t}^E)$$
with sectoral bankruptcy rates δ_F and δ_I.

Savings can be in the form of foreign bonds B_t or in home bonds D_t which trade in complete markets. The household also pays a lump sum tax. Thus, the household budget constraint can be expressed as

$$(1 - \tau_{Femployee,t})WF_t L_{F,t} + WI_t L_{I,t} + WU_t U_t + Y_{HP,t}$$
$$+ N_{F,t} Prof_{F,t}^R + N_{I,t} Prof_{I,t}^R + Prof_{F,t}^W + Prof_{I,t}^W - N_{F,t}^E entry_{F,t} - N_{I,t}^E entry_{I,t}$$
$$+ DEP_t \frac{1 + i_{t-1}^{\aa}}{\pi_t} RER_{t-1} B_{t-1} + \frac{1 + i_{t-1}}{\pi_t} D_{t-1t} - RER_t B_t - D_t =$$
$$C_t + Tax$$

where RER_t is the real exchange rate and DEP_t is the depreciation rate of the nominal exchange rate, i_t is the nominal interest rate on home bonds, $i_t^{\aa}$ is the nominal interest rate on foreign bonds, which depends on the exogenous foreign interest rate, on the one hand, and on an interest rate premium related to the relative amount of foreign debt holdings, on the other hand, following Schmitt-Grohe and Uribe (2003).

3.   Wholesale good firms

Formal and informal goods are produced by wholesale good producers and sold by retailers. A continuum of entrepreneurs of $(0,1)$ in each sector use labor ($L_{F,t}$ or $L_{I,t}$) and physical capital (

$K_{F,t}$ or $K_{I,t}$) to produce intermediate goods ($Y_{F,t}$ or $Y_{I,t}$), following a constant returns to scale

technology[1]: $\begin{aligned} Y_{F,t} &= \theta_{F,t}(K_{F,t-1})^{\psi_F}(L_{F,t})^{1-\psi_F} \\ Y_{I,t} &= \theta_{I,t}(K_{I,t-1})^{\psi_I}(L_{I,t})^{1-\psi_I} \end{aligned}$, where $\theta_{F,t}$ and $\theta_{I,t}$ are exogenous sectoral

productivities, and ψ_F and ψ_I are the sectoral capital income shares. Wholesale firms choose

capital and labor by maximizing profits,

$Prof_{F,t}^W = MC_{F,t}Y_{F,t} - WF_tL_{F,t} - RK_tK_{F,t-1} - HC_{F,t}H_{F,t}$ where $MC_{F,t}$ is the price of wholesale

goods. The hiring cost is denoted by $HC_{F,t}$, while $H_{F,t}$ is the number of hired people.

4.   Retailer good producers

Retailer s maximises its expected discounted stream of future profits $\max E_t \sum_{k=t}^{\infty} Q_{t,k} Prof_{F,k}^R(s)$

where $Q_{t,k}$ is the stochastic discount factor and the one-period profit is

$Prof_{F,t}^R(s) = \left(\dfrac{P_{F,t}(s)}{P_t} - MC_{F,t}(s) \right)\left(\dfrac{P_{F,t}(s)}{P_{F,t}} \right)^{-\eth_{F,t}} QD_{F,t} - R(P_{F,t})(s)$. $MC_{F,t}(s)$ is the price final firm

s pays when purchasing the wholesale goods.

5.   Investment and capital goods

The capital producer owns physical capital, and, by investing, produces new physical capital.
Investment is subject to a capital adjustment cost. This set-up follows that of Bernanke et al. (1999).
The capital producer invests such that its profit is maximized:

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[1] Because in equilibrium all $i \in (0,1)$ intermediate firms follow the same optimization process, for the sake of simplicity we disregard the symbol i when describing the intermediate firms' optimization in most of this section.

$$\max Q_t \left\{ \frac{P_{INV,t}}{P_t} I_t - \frac{\phi_{INV}}{2} \left(\frac{\frac{P_{INV,t}}{P_t} I_t}{K_{t-1}} - \delta \right)^2 K_{t-1} - \frac{P_{INV,t}}{P_t} I_t \right\}$$

where Q_t is the price of physical capital.

The capital law of motion is standard, except that the price of investment is not equal to the general economy-wide price level because only goods produced in the formal sector can be used for investment:

$$K_t = (1-\delta)K_{t-1} + \frac{P_{INV,t}}{P_t} I_t - \frac{\phi_{INV}}{2} \left(\frac{\frac{P_{INV,t}}{P_t} I_t}{K_{t-1}} - \delta \right)^2 K_{t-1}$$

Aggregate investment is a composite of home produced and imported goods:

$$I_t = \left[\alpha^{\frac{1}{\eta}} I_{H,t}^{\frac{\eta-1}{\eta}} + (1-\alpha)^{\frac{1}{\eta}} I_{f,t}^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}}$$

6.   Labor market dynamics

The labor force is fixed at 1, so that the unemployment rate $UNEMP_t$ is 1 minus formal and informal employment L_t, $\begin{aligned} L_{F,t} + L_{I,t} &= L_t \\ U_t &= 1 - L_t \end{aligned}$. Employment in each sector follows a law of motion of the type

$L_{F,t} = (1 - probf_{F,t})L_{F,t-1} + H_{F,t}$. At the beginning of period t $L_{F,t-1}$ people are employed. Then, at

the beginning of period t $probf_{F,t}L_{F,t-1}$ people are fired, where the exogenous firing probability is

$probf_{F,t}$. During period t, firms hire new workers. After firing and hiring is over, the end of period t

employment will be $L_{F,t}$, which is also the level of employment at the beginning of period $t+1$.

Hiring cost is a function of hiring probability: $HC_{F,t} = \beta_{HCF,t} \left(probh_{F,t} \right)^{\alpha_{HCF}}$, where the hiring

probability is $probh_{F,t} = \dfrac{H_{F,t}}{U_{t-1} + probf_{F,t}L_{F,t-1} + probf_{I,t}L_{I,t-1}}$. Thus, the probability of hiring

depends on the number of hired people $H_{F,t}$ (the higher the number of hired people, the higher

the probability of hiring) and on the number of people – potentially – available to hire. We assume

that not only those who were unemployed at the beginning of period t can be hired, but also those

who have just lost their jobs in any of the sectors. The exogenous term $\beta_{HCF,t}$ represents the per

capita hiring cost, and this is the labor market deregulation variable, too. Finally, α_{HCF} is the

elasticity of hiring cost with respect to the hiring probability.

7. Wage bargaining

Workers and firms bargain over real wages, a Nash bargaining process that can be proxied by a
weighted maximization of the relative benefits to firms and workers, with the weights being the
exogenously determined bargaining power of workers:

$$\max \left(V_t^F - V_t^U \right)^{\lambda_{F,t}} \left(J_t^F \right)^{1-\lambda_{F,t}}$$
$$\max \left(V_t^I - V_t^U \right)^{\lambda_{I,t}} \left(J_t^I \right)^{1-\lambda_{I,t}}$$

, where $\lambda_{F,t}$ is the bargaining power in the formal sector, V_t^F is the

value function of workers in the formal sector, V_t^I is the value function of workers in the informal

sector, V_t^U is the value function of the unemployed, a J_t^S is the value function of firms in sector S

(formal or informal).

8. Trade

Exports QX_t respond to the relative price of exports with elasticity $-VATHETAX$.

$QX_t = (\dfrac{PXPstar_t}{alphax_t})^{(-VATHETAX)}$. In turn, imports QM_t are the sum of imported consumer goods Cf_t ,

imported investment goods If_t and imported government consumption goods $Gf1_t$

$$QM_t = Cf_t + If_t + Gf1_t$$

9. Fiscal policy

The government collects labor taxes from the formal sector $(\tau_{Femployee,t} + \tau_{Femployer,t})WF_t L_{F,t}$ and a

lump sum tax Tax_t to fund Government spending $\dfrac{P_{F,t}}{P_t}G_t$ and unemployment insurance $WU_t U_t$,

managing public debt issued in domestic currency $Debt_t$ to smooth temporary revenue and

spending fluctuations.

$$\frac{P_{F,t}}{P_t}G_t + WU_t U_t + \frac{1+i_{t-1}}{PIE_t} * Debt_{t-1} =$$

$$Debt_t + Tax_t + (\tau_{Femployee,t} + \tau_{Femployer,t})WF_t L_{F,t}$$

Government spending is partly on domestic goods $G_{H,t}$ and partly on foreign goods $G_{f,t}$.

$$G_{H,t} = \alpha G_t \left(\frac{P_{F,t}}{P_{INV,t}}\right)^{-\eta}$$

$$G_{f,t} = (1-\alpha)G_t \left(\frac{P_{f,t}}{P_{INV,t}}\right)^{-\eta}$$

Fiscal policy is geared at keeping the public debt to GDP ratio $\dfrac{Debt_t}{ZZ_t}$ fluctuating around a steady

state value $DEBTGDPbar$.

$$log\left(\frac{Debt_t}{ZZ_t}\right) = (1 - rhotaxF) * log(DEBTGDPbar)$$

$$+ rhotaxF * log\left(\frac{Debt_{t-1}}{ZZ_{t-1}}\right) + epsTax_t$$

Similarly, the government spending to GDP ratio is kept around a given policy level $Gbar$.

$$log\left(\frac{G}{ZZ}\right) = (1-rhoG)*log(Gbar)+rhoG*log\left(\frac{G_{t-1}}{ZZ_{t-1}}\right)+epsG_t$$

And labor tax rates for employer and employees and the unemployment allowance are kept stable around fixed levels ($taxF\_employeebar$, $taxF\_employerbar$, and $WUbar$). The fiscal adjustment takes place on the lump-sum taxes Tax_t.

$$log(taxF\_employee_t) = (1-rhotaxF)*log(taxF\_employeebar)$$
$$+rhotaxF*log(taxF\_employee_{t-1})+epstaxF\_employee_t$$

$$log(taxF\_employer_t) = (1-rhotaxF)*log(taxF\_employerbar)$$
$$+rhotaxF*log(taxF\_employer_{t-1})+epstaxF\_employer_t$$

$$log(WU_t) = (1-rhoWU)*log(WUbar)+rhoWU*log(WU_{t-1})+epsWU_t$$

10.   Monetary Policy

The central bank follows an inflation targeting regime with a policy reaction function that cares about interest rate smoothing and cares about deviations of inflation and output from their steady state levels.

$$log(1+i_t)-log(1+i^{SS}) = gammai*\left(log(1+i_{t-1})-log(1+i^{SS})\right)$$

$$+(1-gammai)*\left(\begin{array}{c}gammaPIE*\left(log(PIE)-log\left(PIE^{SS}\right)\right)\\+gammaY*\left(log(ZZ)-log\left(ZZ^{SS}\right)\right)\end{array}\right)+epsi;$$

11.   Market clearing

The demand for formal goods QDF_t is equal to the sum of formal consumption goods CF_t, formal

goods used for investment IH_t, formal goods used for government consumption GH_t and formal

goods exported QX_t. $QDF_t = CF_t+IH_t+GH_t+QX_t$ In contrast, the demand for informal goods

QDI_t is only used to satisfied the consumption demand of informal goods CI_t. $QDI_t = CI_t$

At the aggregate level, the hiring costs and firm entry costs generate frictions that create a wedge between the production of formal and informal goods and the demand for both goods, explaining why reducing those frictions can increase both production and consumption.

$$YF_t = QDF_t + \frac{HCF_t * HF_t}{\frac{PFPP_t}{PHP_t}} + \frac{NFE_t * ENTRYNF_t}{\frac{PFPP_t}{PHP_t}} + \frac{dF_t}{2} * \left(\frac{PFP_t}{PFP_{t-1}} * \frac{PIEH_t}{PIE^{SS}} - 1 \right)^2 * \frac{QDFs_t}{\frac{PFPP_t}{PHP_t}} * NF_t$$

$$YI_t + YHP_t = QDI_t + \frac{HCI_t * HI_t}{\frac{PIPP_t}{PHP_t}} + \frac{NIE_t * ENTRYNI_t}{\frac{PIPP_t}{PHP_t}} + \frac{dI_t}{2} * \left(\frac{PIP_t}{PIP_{t-1}} * \frac{PIEH_t}{PIE^{SS}} - 1 \right)^2 * \frac{QDIs_t}{\frac{PIPP_t}{PHP_t}} * NI_t$$

GDP is defined as usual, adjusting the components by their relative prices

$$ZZ_t = C_t + \frac{PFPP_t * PHP_t}{PHPP\_I_t} * \left(I_t + G_t \right) + PFPP_t * PHP_t * QX_t - PfPP_t * QM_t$$

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ADDRESSING GENDER ISSUES IN ARGENTINA'S LABOR MARKET[1]

A. Background

1.   Argentina's female labor force participation rate is lower than that of Brazil, Chile, Peru, and Uruguay, and is below the OECD average. Furthermore, the ratio of the female to male labor force participation rate is lower than all other Latin American countries except for Mexico. Among countries in the region, Chile, Colombia, and Ecuador had a ratio below that of Argentina in 1990 (and in 2000 for Chile), but by 2014, these countries had all closed the gap between males and females in labor force participation. For Argentina, the gap has remained constant since early 2000s.

Female labor force participation

Source: World Bank, Gender Statistics

2.   More than 90 percent of women in the labor force in Argentina are employed in the service sector, a rate that is approximately 12 percentage points above that in Brazil or Mexico and more than 5 percentage points above the OECD average. The service sector is composed by both a modern service sector, but also by a traditional and large share of the informal sector.

Employment by Sector and Gender

Source: World Bank, Gender Statistics

**3.   Argentina lags at least one of its major peers in each of the four components of the Gender Inequality Index (Gindex).[2]** The Gindex (developed by Jain-Chandra and others, 2017)

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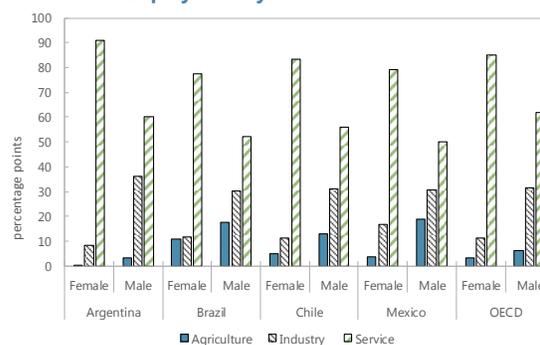
[1] Prepared by Lisa Kolovich, Vivian Malta, Marina Mendes Tavares (all from SPR).

[2] The index is constructed using indicators of empowerment, health, legal rights and financial access. The first two dimensions are captured by the United Nations' Gender Inequality Index, but the index has drawn criticism for not capturing legal empowerment. To this end, the index is augment the index with information from the Women, Business and the Law database by using indicators from two dimensions that are also available back to 1960 in the World Bank's 50 Years of Women's Legal Rights database, accessing institutions, and using property.

incorporates not only indicators of education and health, but also equality of legal rights and financial access. It therefore measures important differences of opportunity across genders, which could have implications for female labor force participation rates in Argentina. Though Argentina performs better than Brazil and Mexico in terms of the index's educational empowerment score, it lags Brazil and Mexico when looking at legal empowerment. For financial access, Argentina is behind Brazil and Chile.

Gender Inequality Index (2015)

Source: United Nations Development Programme, Human Development Reports.
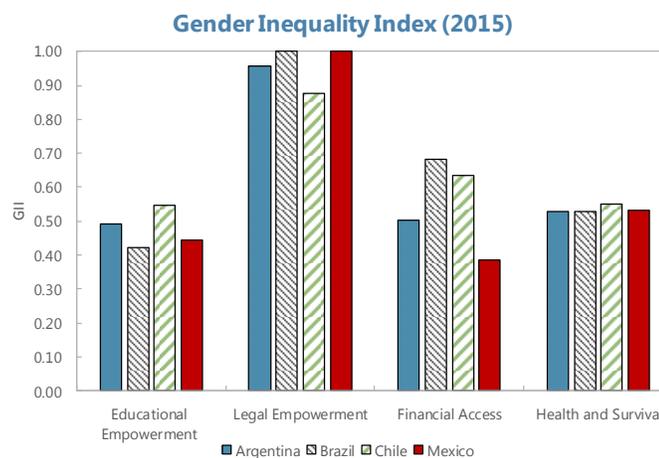
4.   Increasing gender equality and closing the gender gap can generate growth. Gender gaps in education can harm growth (Klasen and Lamanna (2009), Knowles et al. (2002) and Seguino (2010)); improvements in female health outcomes can raise growth (Bloom, Kuhn, and Prettner (2015)); and legal barriers reduce female labor force participation (IMF, 2015). Aguirre et al. (2012) estimate that increasing female employment to male employment levels, would raise GDP per capita in Argentina by approximately 12 percent.

B.   Labor Market Conditions for Women in Argentina

5.   In Argentina women work more in the informal sector than men. According to the Household Survey (*Encuesta Permanente de Hogares de Argentina, March 2017*), 39 percent of the women in the labor force work in the informal sector (*versus* 34 percent for men). Men also hold most of the formal sector jobs (56 percent) and most of the full-time formal jobs (65 percent).
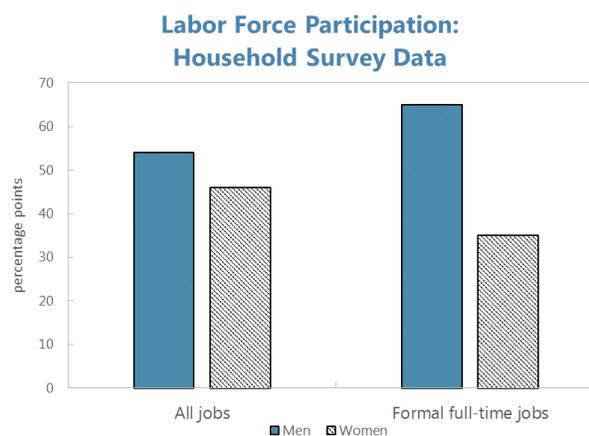
6.   Informality and inequality (particularly gender) are tightly linked. Informal jobs are characterized by lower earnings, poor employment conditions, lack of protection, compulsory overtime or extra shifts, lay-offs without notice or compensation, unsafe working conditions and the absence of social benefits such as health insurance, sick pay and maternity leave. The household survey shows that hourly wages are on average 50 percent lower in the informal sector than in the formal sector. Argentina is among the emerging economies with the largest wage gap between formal and informal workers (OECD, 2015c). These jobs are concentrated in the service sector, and workers are on average less educated than formal workers (see companion SIP).

Labor Force Participation: Household Survey Data

Source: Argentina Household survey, March 2017

7.   The wage gender gap in Argentina is rather high. The overall gender wage gap is the difference between females and males' total earnings from labor, and it is 24 percent in Argentina, based on household survey data. This gap can reflect different working conditions and job characteristics between genders, related for example to the number of hours worked or the skills required for the job. However, they can also reflect pure gender discrimination—a wage premium for male workers that cannot be explained by controlling for observable individual and job characteristics.

8.   We estimate both explained and unexplained components of the gender wage gap in Argentina. Following Blinder (1973) and Oaxaca (1994), we run linear regression models of men and women's hourly wages on workers' age, education, sector of activity, location and occupation, using Argentina's household survey data. We thus estimate what part of the wage gap can be explained by observable variables, and what part cannot be explained (reflecting gender discrimination). We perform the method for full-time workers first, and then separately for full-time workers in the formal versus informal sectors.

9.   We find evidence of significant gender wage discrimination, particularly in the informal sector. The unexplained component of the wage gender gap is equal to 14.9 percent if we consider all full-time workers. However, for jobs in the informal sector the unexplained component is almost three times larger than in the formal sector (27.5 percent vs 9.2 percent). This result suggests that there is more discrimination against women in the informal sector, where institutions and rule of law are weak. Another interesting result is the negative coefficient for the "explained" part of the wage gender gap. This suggests that controlling for age, education, sectors, location, and occupation, women receive salaries that are smaller than what would have been predicted by the regression.

Decomposition	Full-Time Workers	Formal Full-Time Workers	Informal Full-time Workers
Explained	-0.106***	-0.0709***	-0.0766***
	(0.087)	(0.008)	(0.011)
Unexplained	0.149***	0.0919***	0.275***
	(0.013)	(0.011)	(0.023)
Number of observations	11,108	6,189	4,919

C.   Policies to Address Gender Issues in Argentina

10.   To analyze the impact of reforms on economic growth, income inequality, and female labor force participation, we build a dynamic general equilibrium model with heterogeneous agents. The policies considered are (i) a reduction of the tax wedge on labor income (ii) measures that reduce discrimination against women in the formal sector, and (iii) a subsidy to childcare to low- and mid-income formal female workers.

11.   The model is calibrated to match Argentina's macro and micro data and captures important aspects of that economy. Our model replicates important features of the Argentinian economy, such as tax, transfers, and pension systems, as well as the duality of formal and informal labor markets. Agents in this framework differ from each other in terms of generation (children, young adults, adults, old), gender (male and female) and an initial ability received at birth. These differences generate distinct incentives and choices for agents throughout the life cycle. The model also features endogenous human capital formation. Its full description can be found in Annex I of this SIP.

12.   The model treats separately men's and women's labor supplies, making it an ideal tool to study gender and distributional effects of policies. We built a framework where husbands and wives decide together how much their families should consume, how much labor each of them should supply to the formal and informal sectors, and how much to invest in their kids' education. Wives and husbands have different decisions towards participating in the labor market: when women supply labor, there is a utility cost incurred by the family. This cost relates to the difficulty of coordinating multiple household activities, such as home production and rearing children. Furthermore, the model features gender discrimination in formal labor markets in the form of unexplained gender wage gaps.

Reducing the Tax Wedge

13.   Reducing the tax wedge in Argentina can yield higher economic growth, increase female labor supply, and lower the wage gender gap. We simulate the impact of a reform in labor income tax as described in the companion SIP (Dudine et al, 2017). The reform reduces employer and employees' social security contributions to a flat 10 percent rate (excluding contributions to health care or *obras sociales*),[3] while cutting by about half the main deductions on personal income tax. The mains results are (see Figure 1):

- Long-run GDP would be 1.2 percent higher, reflecting a greater formal sector, which becomes more competitive, attracts more skilled workers (particularly females), and increases the return to human capital accumulation, leading to more investment in education.

- In the new model's steady state, the average real wage would be 3 percent higher for females and 2.7 percent for males, reducing the wage gender gap as higher skilled (also higher earners) females join the labor force and accumulate more human capital. After the reform, hours worked by females in the formal sector would be higher (by about 12 percent).

- The reform would reduce poverty, while inequality would not be affected. The increase in overall demand increases the prices of informal goods, which are mostly produced by low-skilled, low wage workers, increasing their income and reducing poverty. The impact on

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[3] Including health care, the reform implies a reduction in employees' social security contribution rate of 3.4 percentage points and a decrease in the employer's social security contribution rate of 5.2 percentage points.

inequality is negligible, because the reform benefits both low income earner that work on the informal sector and high-skilled earner that work on the formal sector.

Reducing Discrimination in the Work Place

14.   Reducing discrimination against women in the formal sector increases female labor force participation, reduces poverty, and boosts GDP growth (Figure 1). We simulate a policy that eliminates Argentina's unexplained wage gender gap in the formal sector.[4] This would reduce the overall gender wage gap by 6 percentage points, increasing the returns of working in the formal sector and resulting in a larger share of female employment in this sector. High-skilled females are particularly affected by the measure, as they see the largest absolute increase in the return from working in the formal sector. The result is a formal sector that is more productive as it employs more skilled workers. The greater aggregate demand pushes up the prices of informal goods, which are mostly produced by low-skilled, low wage agents, increasing their income and reducing poverty.

Reducing Costs for Working Women

15.   Giving childcare subsidies for low and middle income women that work on the formal sector decreases gender inequality and boost long-term growth (Figure 1). Increasing the provision of childcare subsidies for mothers that earn, at most, the average income in Argentina and work on the formal sector, expands the participation of women in the formal sector, increases human capital, reduces the wage gender gap and ultimately generates higher economic growth. The model shows that the measure would be broadly budget neutral, as higher income tax payments from women compensate the childcare subsidy cost.

D.   Conclusions

16.   Female labor force participation in Argentina is lower than its peers. Working women work more in the informal sector than men. Reducing the size of the informal sector generates higher economic growth and lower gender inequality. Policies that bring workers from the informal sector to the formal sector can produce sustainable and inclusive growth. Female employment in the informal sector is larger than men, and this is worrisome since informal jobs are characterized by larger wage gender gaps, lack of social protection, sometimes unsafe working conditions, and instability. Reducing the informal sector generates higher and inclusive growth. Policies like increasing job flexibility, reducing and simplifying dismissal procedures, and getting the minimal wage right can reduce the size of the informal sector.

17.   Policies that reduce discrimination against women can generate higher economic growth, reduce the wage gender gap, and reduce poverty. Reducing discrimination against

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[4] This could require reducing legal barriers to female employment (for instance, based on the 2016 World Bank *Women, Business and the Law*, there are still tasks and occupations prohibited to women in Argentina) or through launching awareness campaigns on gender inequalities. Mechanically in the model we do this by altering the "discrimination parameter" (denoted with φ) from 0.85 to 1 (Annex).

women increases female labor force participation, their working hours, and their human capital, and these effects are particularly important for high-skilled women that benefits more form the reform. The reform also reduces poverty, mainly due to the increase in the overall demand of the economy that pushes the prices of informal goods up. These goods are mostly produced by low income workers that benefit the mostly from this reform.

18.   Providing childcare subsidies for low and middle-income women is a winning policy, since it generates economic growth, boosts government revenues and lowers income inequality. The policy gives more incentives to women in lower deciles of the income distribution to work in the formal sector, accumulating higher levels of human capital, and closing the wage gender gap.

Figure 1. How Do These Policies Change GDP and the Gender Wage Gap?

GDP changes in the long run

Formal Sector: intensive margin for females

Changes in Overall Wage Gap
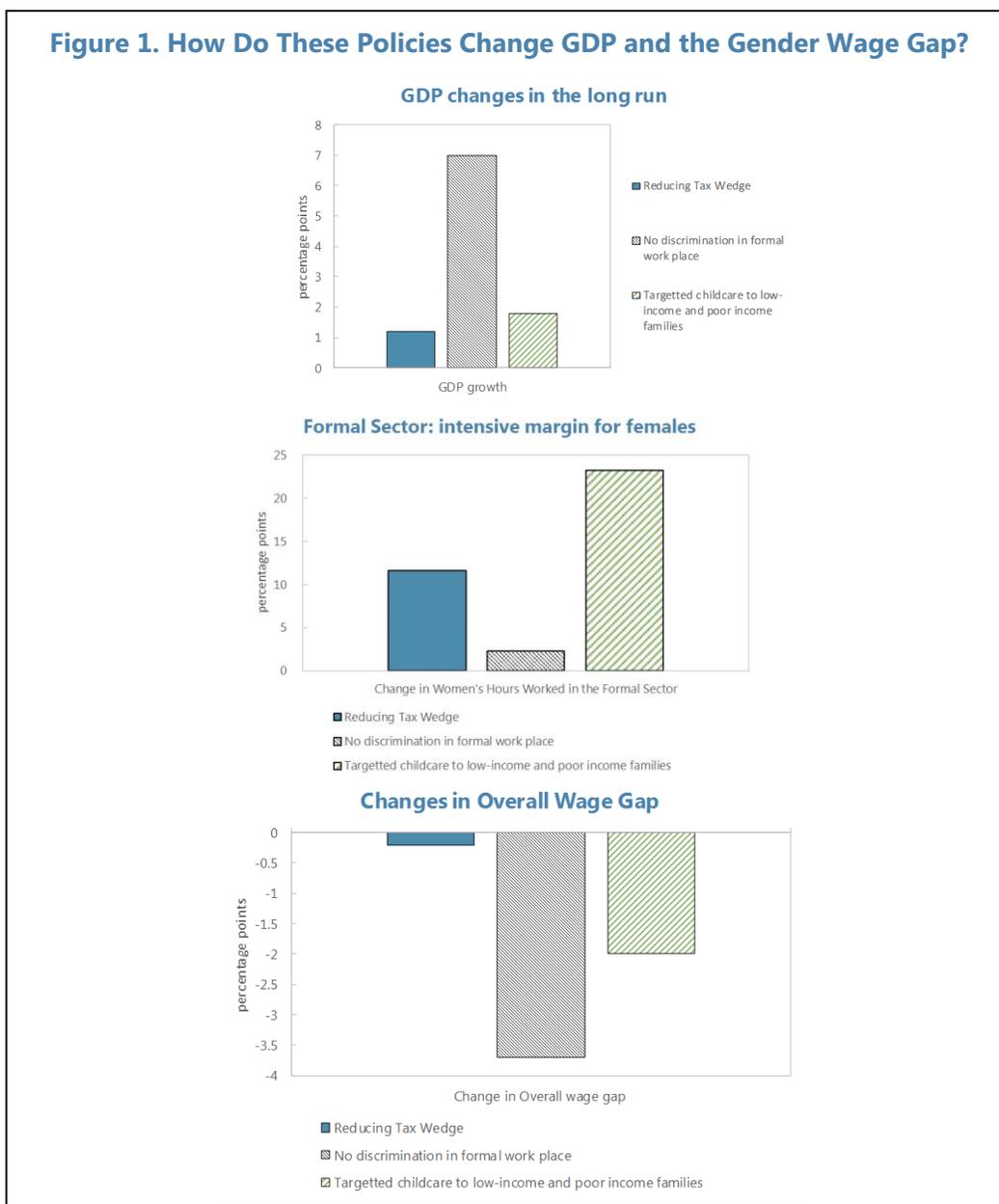
Appendix I. Description of the Model

We construct an overlapping generations (OLG) model with three periods to analyze an economy where agents differ from each other in many aspects: gender, a shock received at birth, accumulation of human capital, income, and (of course) generation. In this economy, a household is a family, comprised of a husband, a wife and two kids, or simply a husband and a wife (after their two kids have married and formed another household/family). Husbands and wives make all the decisions for the household, together. Men and women's labor supply are chosen endogenously.

In the first period a household is comprised of a husband, a wife, and two kids (a boy and a girl). Husband and wife decide together how much to work in the formal and informal sector, how much to invest in kids' education, and how much to consume of each of the two types of goods in this economy (formal and informal goods). In the second period, kids have grown and started their own family, so that the initial household has now only the husband and the wife. They now only choose how much labor to supply in the formal and informal sectors, and how much to consume. Whenever women supply labor (in either period 1 or 2), there is a utility cost incurred by the family. This cost relates to the difficulty of coordinating multiple household activities, such as home production and rearing children. When agents are old (period 3), they receive pensions provided by the government.

The government collects income tax, social security contributions, consumption tax and corporate tax. It spends on cash transfers to households, on pensions benefits, and on goods produced in the formal sector. The formal sector in this economy is modeled as a representative firm that hires both male and female effective hours of labor to produce the formal good. The firm practices discrimination of salaries by paying women less than their marginal product of labor. This reflects the gender wage gap after controlling for education, experience, type of jobs, location, that we find in Argentina's household survey data and also in ILO's 2014/2015 Global Wage Report.

Endogenous Human Capital Accumulation

Human capital formation starts at birth and evolves according to an innate shock, education, and the amount of labor supply to the formal sector. In period 1 human capital is $h_1 = \varepsilon e^{\alpha_e}$. In periods 2 and 3, human capital is given by

$$h_j = (1 - \delta)h_{j-1} + \left(1 + l^{g,fo}\right)^{\alpha_h}, \quad where\ gender\ g\ \in \{m, f\}\ and\ j \in \{2,3\}$$

Recursive Problems of Households

We describe below the recursive problems of households for each of the three periods. We denote by V_t^j the value function for each household at date t and period of life j.

We start by posing the first problem of a household, as soon as the household is formed (period 1). At this stage, the household is comprised of a husband, a wife and two kids (one boy and one girl). The marriage market is such that males and females randomly marry other females and males, respectively, with same age and human capital.

Household problem in period 1

The household decision at this stage will depend on their children's future utility. Therefore, parents' decisions on how much to spend on children's education will also take into account the expected earnings of their children. The state of a household in the beginning of this period is given by husband and the wife's age and human capital (assumed to be equal - given the matching process), and the idiosyncratic initial shock received by their children (ε). We assume that there is only one shock for both children and that parents invest the same amount on the boy and the girl. Thus, both children have the same human capital at this stage. Given wages w^f and w^m (measured in units of efficient labor), the problem of the household in period 1 is to maximize utility choosing consumption, amount spent on kids' education, and labor force supply to the formal and informal sectors:

$$V_t^{j=1}(h, \varepsilon) = \max_{\{c, e, l^{m,fo}, l^{m,inf}, l^{f,fo}, l^{f,inf}\}} \cdot u(\cdot) + \beta V_{t+1}^{j=2}\left(h^{f'}, h^{m'}\right) + \eta_k \beta \left\{ V_{t+1}^{j=1}(h^k, \varepsilon) + V_{t+1}^{j=1}(h^k, \varepsilon) \right\}$$

subjected to

$$\theta \left[c_{fo}(1 + \tau^c) p_{fo} + c_{inf} p_{inf} \right] + 2 p_{fo} e$$

$$\leq \left(1 - \tau^f(\cdot) \right)\left(1 - \tau^{ss,f}(.) \right) w^f l^{f,fo} h^f + \left(1 - \tau^m(\cdot) \right)(1 - \tau^{ss,m}(.)) w^m l^{m,fo} h^m$$

$$+ p_{inf}\left(y^{m,inf} + y^{f,inf} \right) + T_1(\cdot)$$

$$y^{g,inf} = z^{inf}\left[l^{g,inf} \right]^{\alpha_{inf}}, \quad where\ gender\ g \in \{m, f\}$$

$$h^{g'} = (1 - \delta)h^g + \left(1 + l^{g,fo} \right)^{\alpha_h}, \quad g \in \{m, f\}$$

$$h^k = \varepsilon e^{\alpha_e}$$

$$l^{g,fo} + l^{g,inf} \leq 1, \quad g \in \{m, f\}$$

$$l^{m,fo}, l^{m,inf}, l^{f,fo}, l^{f,inf} \in (0,1)$$

In the above problem, $h = h^f = h^m$ are wife's and husband's human capital (assumed to be equal due to the matching process); h^k is their kids' ability in the next period (which will be the same for the boy and the girl, since they both got the same human capital). ε is the birh shock that children receive at birth. $l^{m,fo}$ and $l^{f,fo}$ are male and female's time devoted to working in the formal sector; $l^{m,inf}$ and $l^{f,inf}$ are male and female times devoted to working in the informal sector. η_k is the parameter indicating preference for each child's utility. θ is a parameter denoting higher consumption given the presence of kids in the household in period 1. $\tau^m(\cdot)$ and $\tau^f(\cdot)$ are tax rate functions for males and females, and depend on husband and wife's formal income. τ_c is the tax rate on consumption. $\tau_{ss,f}$ and $\tau_{ss,m}$, are the social security contributions that are different for male and females, and are functions of husband and wife's formal earnings. e is the amount of education invested in each of the 2 children. $T_1(\cdot)$ and $T_1(\cdot)$ are transfers functions, reflecting government cash transfers programs, that depend on husband and wife's earnings in the formal sector. $y^{m,inf}$ and $y^{f,inf}$ are the production functions in the informal sector. $h^{g'}$ is the human capital of husband or wife in the following period. Note that children's education is expressed in terms of formal goods prices.

Household problem in period 2

After children get married, parents live as a two-member household and choose consumption and labor supply in the formal and informal sectors. The state of a household at the beginning of this stage is given by their human capital $(h^f$ and h^m). Their value functions are described below:

$$V_t^{j=2}(h^f, h^m) = \max_{\{c, l^{m,fo}, l^{m,inf}, l^{f,fo}, l^{f,inf}\}} u(\cdot) + \beta V_{t+1}^{j=3}(h^{f'}, h^{m'})$$

subjected to

$$c_{fo}(1 + \tau^c)p_{fo} + c_{inf}p_{inf}$$

$$\leq \left(1 - \tau^f(\cdot)\right)\left(1 - \tau^{ss,f}(.)\right)w^f l^{f,fo}h^f + \left(1 - \tau^m(\cdot)\right)(1 - \tau^{ss,m}(.))w^m l^{m,fo}h^m$$

$$+ p_{inf}(y^{m,inf} + y^{f,inf}) + T_2(\cdot)$$

$$y^{g,inf} = z^{inf}[l^{g,inf}]^{\alpha_{inf}}, \quad where \; gender \; g \in \{m, f\}$$

$$h^{g'} = (1 - \delta)h^g + (1 + l^{g,fo})^{\alpha_h}, \quad g \in \{m, f\}$$

$$l^{g,fo} + l^{g,inf} \leq 1, \quad g \in \{m, f\}$$

$$l^{m,fo}, l^{m,inf}, l^{f,fo}, l^{f,inf} \in (0,1)$$

Household problem in period 3

In period 3 both husband and wife retire, receiving pensions from the government $T_P(h^m)$ and $T_P(h^f)$, respectively. The household in chooses consumption so as to maximize:

$$V_t^{j=3}(h^f, h^m) = \max_{\{c\}} u(\cdot)$$

subjected to

$$T_p(h^m) + T_p(h^f) \geq c_{fo}(1 + \tau^c)p_{fo} + c_{inf}p_{inf}$$

$$T_P^g = \overline{T_P} + \rho h^g, \quad where \; gender \; g \in \{m, f\}$$

A retiree receives a pension benefit composed of a constant flat amount $(\overline{T_P})$ and an amount dependent on how much he or she worked in the formal sector, which we approximate by using the human capital variable.

Formal Sector

A representative firm hires both male and female effective hours of labor to produce the formal good. Its maximization problem is given by:

$$\max_{\{L^{f,fo}, L^{m,fo}\}} \sum_{t=0}^{\infty} \beta^t (1 - \tau_v)\left[p_{fo}z^{fo}\left(L^{m,fo} + \phi L^{f,fo}\right)^{\alpha_{fo}} - \left(1 + \tau_{ssf}\right)\left(w^m L^{m,fo} + w^f L^{f,fo}\right)\right],$$

where ϕ is a parameter reflecting direct discrimination in the workplace, τ_v is the tax on firms' profits and τ_{ssf} is the social security contribution rate paid by firms (employers). The firm's profits (after taxes) are redistributed to the richest households (last decile of the income distribution).

Government Budget Constraint

The government taxes consumption, (formal) labor income and firms profits, and collects social security contributions. It spends on transfers to households, pension benefits, and formal goods (total expenditure on formal good equals to G). Its budget constraint must hold every period, and it states that the revenues from collections must be equal to the expenditures. Let $\bar{C}$ be total expenditure in consumption goods (net of VAT) in this economy at time t. Abstracting from the time subscript, the government budget constraint for each time t is the following:

$$
\begin{aligned}
\tau_c \bar{C} + &\left[\tau_f(.) + \tau_{ss,f}(.) - \tau_f(.).\tau_{ss,f}(.) + \tau_{ssf}\right] w^f L^{f,fo} \\
&+ \left[\tau_m(.) + \tau_{ss,m}(.) - \tau_m(.).\tau_{ss,m}(.) + \tau_{ssf}\right] w^m L^{m,fo} \\
&+ \tau_v\left[p_{fo}z^{fo}\left(L^{m,fo} + \phi L^{f,fo}\right)^{\alpha_{fo}} - \left(1 + \tau_{ssf}\right)\left(w^m L^{m,fo} + w^f L^{f,fo}\right)\right] = \\
&\mu_1 T_1(.) + \mu_2 T_2(.) + \mu_3\left[2\overline{T_P} + \rho\left(h_3^m + h_3^f\right)\right] + G
\end{aligned}
$$

Description of the Steady State Equilibrium

We will consider a stationary equilibrium in which wages and prices are constant, and the distribution of human capital for both males and females at each period j are stationary. Let:

- $\Gamma_1(h, \varepsilon)$ be the stationary distribution function of parents' human capital and birth shock in period 1;

- $\Gamma_2(h^f, h^m)$ and $\Gamma_3(h^f, h^m)$ be, respectively, periods 2 and 3 stationary distribution functions of husbands and wives' human capital.

Letting μ_1, μ_2 and μ_3 be the measure of households at each period in time, define the following aggregates:

- C_{fo} (aggregate consumption of formal goods and kids' education):

$$C_{fo} = \mu_1\theta \int_h \int_\varepsilon c_{fo}^1(h, \varepsilon)\, d\Gamma_1(h, \varepsilon) + \mu_2 \int_{hf}\int_{hm} c_{fo}^2(h^f, h^m)\, d\Gamma_2(h^f, h^m) + \mu_3 \int_{hf}\int_{hm} c_{fo}^3(h^f, h^m)\, d\Gamma_3(h^f, h^m) + \mu_1 \int_h \int_\varepsilon e(h, \varepsilon)\, d\Gamma_1(h, \varepsilon)$$

- C_{fo} (aggregate consumption of informal goods):

$$C_{inf} = \mu_1\theta \int_h \int_\varepsilon c_{inf}^1(h, \varepsilon)\, d\Gamma_1(h, \varepsilon) + \mu_2 \int_{hf}\int_{hm} c_{inf}^2(h^f, h^m)\, d\Gamma_2(h^f, h^m) + \mu_3 \int_{hf}\int_{hm} c_{inf}^3(h^f, h^m)\, d\Gamma_3(h^f, h^m)$$

- $Y_{fo} = z^{fo}\left(L^{m,fo} + \phi L^{f,fo}\right)^{\alpha_{fo}}$ is the total production of formal goods

- Y_{inf} (production of informal goods):

$$Y_{inf} = \mu_1 z^{inf} \int\limits_h \int\limits_\varepsilon \left[\left(l_1^{f,inf}(h,\varepsilon) \right)^{\alpha_{inf}} + \left(l_1^{m,inf}(h,\varepsilon) \right)^{\alpha_{inf}} \right] d\Gamma_1(h,\varepsilon)$$

$$+ \mu_2 z^{inf} \int\limits_{h^f} \int\limits_{h^m} \left[\left(l_2^{m,inf}(h^f,h^m) \right)^{\alpha_{inf}} + \left(l_2^{f,inf}(h^f,h^m) \right)^{\alpha_{inf}} \right] d\Gamma_2(h^f,h^m)$$

A competitive equilibrium in this economy is comprised of: stationary distributions of human capital and birth shocks $\Gamma_1(h,\varepsilon)$, $\Gamma_2(h^f,h^m)$, $\Gamma_3(h^f,h^m)$, constant prices and wages $p_{fo}, p_{inf}, w_m, w_f$, together with households' allocations of consumption, labor choices and investment in kids' education, such that:

- w_m and w_f solve the firm's optimization problem
- given prices p_{fo}, p_{inf}, wages w_m, w_f, transfers $T_1(\cdot), T_2(\cdot)$ and pensions $T_p(\cdot)$, households choose consumption, labor supply, and investment in their children education that maximize their utilities, as described in their maximization problems
- the government budget is balanced
- the aggregates of this economy are constants and are given by $C_{fo}, C_{inf}, Y_{fo}, Y_{inf}$ described above
- all markets clear:

  (i)   female formal labor market clears:

$$L^{f,fo} = \mu_1 \int\limits_\varepsilon \int\limits_h h_1^f\, l_1^{f,fo}(h,\varepsilon)\, \Gamma_1(h,\varepsilon)dhd\varepsilon + \mu_2 \int\limits_{h^f} h_2^f\, l_2^{f,fo}(h^f,h^m)\, \Gamma_2(h^f,h^m)dh^f$$

  (ii)   male formal labor market clears:

$$L^{m,fo} = \mu_1 \int\limits_\varepsilon \int\limits_h h_1^m\, l_1^{m,fo}(h,\varepsilon)\, \Gamma_1(h,\varepsilon)dhd\varepsilon + \mu_2 \int\limits_{h^m} h_2^m\, l_2^{m,fo}(h^f,h^m)\, \Gamma_2(h^f,h^m)dh^m$$

  (iii)   formal goods market clears: $Y_{fo} = C_{fo}$

  (iv)   informal goods market clears: $Y_{inf} = C_{inf}$

Calibration Methodology

The model period is 20 years, so that agents work from 20 to 60 years of age, are retired from 60 to 80, and die at 80. Since all agents live and die at 80 years of age, the measure of households at each period must be equal to 1/3 (i.e., $\mu_1 = \mu_2 = \mu_3 = 1/3$).

Preferences. Households have log-linear preferences over formal and informal goods and disutility over total female labor supply (l^f):

$$u\big(c_{fo}, c_{inf}, l^f\big) = \xi_{fo} log\big(c_{fo}\big) + \xi_{inf} log\big(c_{inf}\big) - \xi_l l^f,$$

We calibrate the shares of formal consumption ξ_{fo} and informal consumption ξ_{inf} to match household expenditure on formal and informal goods, respectively, using Argentina's consumer price index weights (*Índice de Precios al Consumidor*, calculated by INDEC), and we estimate these shares to be 70 percent and 30 percent, respectively. Using the same source, parameter η_k (indicating preference over kids' future utilities) is calibrated to match the share of private education in family expenditure in Argentina (2.9 percent). We calibrate ξ_l, the parameter that describes the utility cost from female labor supply, to match the female labor force participation in Argentina, which is 60 percent for females between 21 and 60 years old (according to the March 2017 household survey). The discount factor β is set to 0.96 annually (or 0.44 for every period of 20 years), which is a value commonly used in the economic literature. The parameter θ is set to 1.4, using OECD's modified scale calculations for increase in household consumption when two kids are added in the household[1].

Production. We normalize the price of formal sector to 1. The productivity z^{fo} is calibrated to match the share of formal production on GDP (74 percent, estimated using 2014-2016 national accounts results published by INDEC), while the productivity of the informal sector z^{inf} is normalized. We calibrate firm's discrimination parameter ϕ to match ILO's 2015 Global Wage Report unexplained wage gap in Argentina, which is 14.6 percent.

Initial Shocks. We set 10 initial shocks, that are calibrated so that the model matches each decile of Argentina's income distribution, using the March 2017 household survey.

Human Capital Formation Function. We calibrate parameter α^e to match Argentina's share of private education over GDP (1.1 percent, as per 2014-2016 national accounts results published by INDEC).

Fiscal Policy. We set income tax functions $\tau^f(\cdot) \ and \ \tau^m(\cdot)$ according to Argentina's 2017 income tax brackets, including marginal rates and deductions. Similarly, we use employees' social security contribution functions $\tau^{ss,f}(\cdot) \ and \ \tau^{ss,m}(\cdot)$ according to Argentina's 2017 tax code. In addition, employer's social security rate is set to 22 percent, calculated through the household survey data using the current rules. Tax on consumption τ^c is set to Argentina's average tax rate on consumption (20 percent). Corporate income tax rate is set to 35 percent. In terms of pensions, $\overline{T_P}$ is set to match Argentina's minimal pension benefit (6,377 Argentinian pesos in 2017), and the parameter ρ is calibrated to match Argentina's replacement rate of 88 percent (OECD, 2017). Finally, transfer functions $T_1(\cdot) \ and \ T_2(\cdot)$ are calibrated to match Argentinians' average cash transfers benefits recipients per income and per age group, using the 2017 household survey.

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[1] http://www.oecd.org/eco/growth/OECD-Note-EquivalenceScales.pdf.

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