INTERNATIONAL MONETARY FUND

IMF Country Report No. 18/24

URUGUAY

SELECTED ISSUES

January 2018

This Selected Issues paper on Uruguay was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed on December 21, 2017.

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International Monetary Fund
Washington, D.C.

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URUGUAY

SELECTED ISSUES

December 21, 2017

Approved By
Western Hemisphere Department

Prepared by Yehenew Endegnanew, Galen Sher, Diva Singh, and Frederik Toscani (all WHD)

CONTENTS

THE IMPACT OF EXCHANGE RATE MOVEMENTS ON CONSUMPTION IN URUGUAY[1]

This paper investigates the impact of exchange rate movements on private consumption in Uruguay. We show that a large share of Uruguayan households is liquidity constrained, which allows the transitory real income shocks brought about by exchange rate pass-through to have a significant impact on consumption. Moreover, exchange rate pass-through is highly heterogenous, with relative prices of durables increasing (decreasing) following a depreciation (appreciation). This creates incentives for households to engage in intertemporal substitution where they buy durables when they are relatively cheaper. The results offer a potential explanation for the often noted 'excess volatility of consumption' in emerging markets for the case of Uruguay.

A. Introduction and Overview

1. Anecdotal evidence suggests that the relationship between exchange rate movements and consumption is highly negative in the case of Uruguay. As a motivation, consider the below figure which shows the relationship between changes in the exchange rate (an increase represents a depreciation) and changes in private consumption. A 10 percent depreciation is associated with a reduction in consumption growth of roughly 1 percent for two quarters. Calculating equivalent elasticities for Brazil, Chile, Colombia, Mexico, and Peru we find that only in Peru is the elasticity of a similar magnitude, while it is essentially zero in both Brazil and Colombia.

2. Uruguay is a highly-dollarized economy, which makes the relationship between exchange rate movements and private consumption particularly complex. Dollarization plays an important role in several aspects of the Uruguayan economy—both in the financial system with deposit dollarization above 70 percent and credit dollarization of around 50 percent, and in the real economy, where about 14 percent of the CPI basket consists of goods which are priced in U.S. dollars.[2] Goods priced in dollars are overwhelmingly tradable durables and have a much higher pass-through than others.

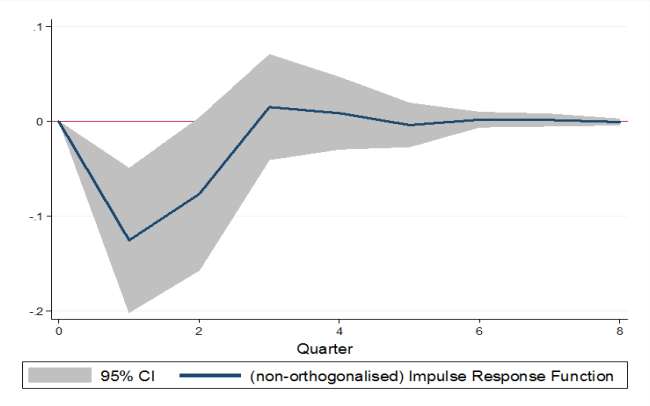
3. We find two main explanations for the impact of exchange rate movements on private consumption in Uruguay. The first is a negative impact of depreciations on real incomes. Nominal wages are fixed in the short-run and with an immediate exchange rate pass-through of around 15 percent, real wages temporarily fall. A high share of Uruguayan households is liquidity constrained leading them to adjust consumption in response to temporary income shocks. Second, we show that exchange rate pass-through by good is very heterogenous, and in particular it is close to 100 percent for durable goods. Depreciations thus act as a price hike on durable goods and durable consumption reacts very strongly to exchange rate movements possibly indicating inter-temporal substitution by households.

[1] Prepared by Frederik Toscani.

[2] See Toscani (2017).

4. We do not find much evidence for exchange-rate-induced wealth effects. To look for wealth effects we start from an exercise by Lluberas and Odriozola (2015) who show that even though saving occurs overwhelmingly in USD, even large exchange rate movements have only a small impact on liquid wealth—largely because so few households have liquid savings. Nevertheless, we cannot exclude that wealth effects matter, especially since houses are priced in USD and many Uruguayans own their home. We can only note that wealth effects would go in the opposite direction of the other effects. Given that overall depreciation (appreciations) are associated with less (more) consumption, the wealth effect thus cannot be strong enough to offset them.

The Relationship between USD Exchange Rate and Private Consumption: Stylized Fact



Source: IMF Staff Estimates. Note The graph shows reduced-form impulse response functions from a binary VAR in first-differences for (log) Private consumption and the de-trended (log) Exchange Rate. Results are virtually indistinguishable when we use the raw exchange rate data instead of the detrended one but detrending accounts for the fact that agents are likely to expect a continued slow depreciation of the Peso given the large inflation differential with the US. Data are quarterly and lag-length of the VAR is 2. Private consumption data from the national accounts is seasonally adjusted using the Census Bureau X-13 method. See data Appendix for details.

5. We also do not find much support for a change in expectations of permanent income as a consequence of exchange rate movements. We use data from the consumer confidence survey and show that the exchange rate does not seem to be related to households' perceptions of their own economic situation nor of the economic situation of the country. We also show that even when controlling for terms-of-trade shocks (as a proxy for real shocks which affect permanent income) exchange rate movements have a strong negative impact on consumption.

6. The negative impact of the exchange rate on consumption seems to carry over to a negative effect on overall GDP. GDP could be largely unaffected by the exchange rate driven volatility in consumption (or even increase) if nearly all the consumption movements were for imported goods.[3] However, using the latest available Input-Output tables we show that a non-trivial fraction of domestically consumed durables good are produced in Uruguay so that the fall in durable consumption also affects domestically produced goods. In a simple VAR setting we show that the overall impact of exchange rate movements on GDP is negative.[4]

7. The remainder of this paper proceeds as follows. Section B briefly lays out the related literature and a few theoretical considerations to provide an underlying structure to the paper.

[3] Recall that we find that overall consumption falls as a consequence of depreciations—expenditure switching from imports to domestic goods does happen but as long as overall consumption falls this.

[4] In a recent publication on external adjustment in Latin America and the Caribbean (WHD April 2017 REO) the IMF showed that while a negative income effect dominated in most countries in the region, a positive expenditure switching effect has become more important over the past years.

Section C then uses the 2014 Uruguayan Household Finance Survey (*Encuesta Financiera de los Hogares Uruguayos* or EFHU-2) to lay out salient features of the household wealth, income and consumption distributions in Uruguay which relate to the theoretical considerations of section B and which will be relevant for the subsequent analysis. Section D shows that the exchange rate does indeed impact private consumption in Uruguay. This is done by estimating a simple Vector-Error Correction Model (VECM) for aggregate private consumption in Uruguay. The core of the analysis is presented in section E which evaluates in some granularity the possible channels through which exchange rate movements might be affecting consumption in Uruguay.[5] Last, section F discusses macro implications of the analysis for GDP and for the volatility of aggregate consumption. The Appendix contains a list with data sources and additional material.

B. Literature and Theoretical Considerations[6]

8. The basis for work on private consumption remains Friedman's permanent income hypothesis which predicts that households should smooth transitory income fluctuations and react to permanent ones.[7] Many modern consumption models following Zeldes (1984) build on this but model optimal consumption under uncertainty rather than perfect foresight. These models yield the insight that uncertainty implies a concave consumption function, with a higher marginal propensity to consume (MPC) at low levels of wealth. The baseline result that transitory income shocks should be saved to a large degree, carries over to these models under uncertainty.

9. Empirical evidence has found consistent evidence that the MPC out of transitory income shocks is excessively high relative to those implied by standard models.[8] Assuming a sizeable share of households which spend all of their available cash every period (so called hand-to-mouth or HtM consumers) has become a prominent way to achieve a higher MPC in theoretical models.[9] Given that HtM households sit at a kink in the intertemporal budget constraint, they fully reflect even transitory income shocks in current consumption.

10. Recent work has shown that across developed countries a large share of the population is liquidity constraint with virtually no savings to speak of and a high MPC. The

[5] Ideally, one would like to be able to have household-level panel data which capture microeconomic heterogeneity in expenditures, income, assets and debt to be able to isolate and estimate each channel. Given the very substantial data constraints, this paper will analyze the link between exchange rate movements and consumption through several complementary but partial approaches to shed more light on the question.

[6] Much of the discussion in this section is based on Carroll (2001) and Kaplan et al. (2014) (as well as Mark Aguiar's and Karen Pence's comments on Kaplan et al.). Also see Carroll (2013) for an overview of the current state of the consumption literature and the importance of acknowledging the fact that aggregate consumption behavior cannot be well captured by a representative household but that heterogeneity in income, assets and potentially preferences are crucial.

[7] Indeed, empirical evidence suggests that this works reasonably well for large fluctuations (see, for example, Hsieh, 2003).

[8] See Johnson et al. (2006) for a prominent example and Jappelli and Pistaferri (2010) for a literature review.

[9] See for example saver-spender models where impatient spenders borrow from patient savers and consume all their income every period (Gali et al., 2006).

usual approach to measure HtM households in the data used to be to look for individuals with no or very little net wealth. Measured this way, however, the number of such households is too low to explain a high aggregate MPC out of transitory shocks. In a recent paper, Kaplan et. al (2014) suggest that net wealth is the wrong measure to detect HtM consumers and that rather net *liquid* wealth should be used—since with some transaction costs, illiquid wealth is not available to smooth small to medium size transitory shocks. They present comprehensive empirical evidence that large numbers of de facto liquidity constrained consumers exist in the U.S. and other advanced economies. They also show that the majority of them are what they call "wealthy hand-to-mouth" consumers—they own illiquid assets but no or very little liquid ones and they would thus not be considered HtM when using a standard net wealth measure. Kaplan and Violante (2014) develop a theoretical model to show that consumers might optimally be wealthy HtM - they invest in illiquid but higher return assets and tolerate the higher volatility across periods to achieve a higher level of lifetime consumption.[10] The authors then show that both poor and wealthy HtM consumers have much higher MPCs than non-HtM consumers.

11. The next section will show that liquidity constraint 'hand-to-mouth' consumers constitute a very large share of Uruguayan households. As a consequence we might expect there to be a high MPC out of transitory income shocks. This provides for a powerful channel through which the exchange rate (via pass-through to prices) can impact consumption in Uruguay.

12. For the remainder of the paper it will also be important to differentiate between durable and non-durable goods consumption. Durable goods are goods which do not immediately depreciate —the lower the depreciation rate, the more durable the good is (examples include cars, furniture and electronics).[11] A key insight is that durable expenditure is more volatile than non-durable expenditure. Consumers utility is increasing in the *flow* of nondurables and the *stock* of durables which implies that when nondurable consumption and expenditure adjusts, durable consumption adjust proportionally but durable expenditure will adjust by more to immediately get to the new desired stock of durables.[12] This also implies a higher elasticity of demand (price and income) for durables than non-durables.

13. Households face a type of inventory problem for durable goods. Hendel and Nevo (2013) show that for storable goods (which include durables but are broader—eg, a Coca-Cola is storable) consumers face a type of inventory problem—and they optimally buy more than they consume when prices are low and vice versa. Hendel and Nevo also find that this is rationally true for short-term price drops such as sales. In the case of Uruguay, we will show that exchange rate movements have an extremely high pass-through to durable goods prices so that appreciations could potentially be viewed as a 'sale' for durables while a depreciation is the opposite.

[10] Apart from optimal portfolio allocation, wealthy HtM consumers can also arise following a large negative shock or extreme impatience. Hyperbolic discounters might be wealthy HtM consumers to protect themselves against future excessive consumption, for example.

[11] A good which does not depreciate at all is equivalent to wealth.

[12] Consumers attempt to smooth the service flow of durable services rather than expenditure on durables. Of course, when households are liquidity constrained they cannot smooth as desired (see above discussion on HtM consumers).

C. A Few Stylized Facts on the Distribution of Household Savings, Income, and Consumption

14. In light of the above theoretical discussion, we highlight salient features of Uruguayan households' balance sheets. For this purpose, we use data from the 2014 household finance survey (EFHU-2) which is ideally suited for such an exercise.[13] The EFHU asks participants questions on real assets and related debts, liquid assets, other debts, business ownership, income and employment history, pensions, consumption and use of electronic payments and thus allows a detailed overview of household balance sheets.[14] This section is organized in terms of a list of relevant summary statistics followed by key take-aways based on those summary statistics which will be used in later parts of the paper.

Liquid assets

15. Only 18 percent of Uruguayan households have liquid assets and 11 percent of households have total liquid assets over one monthly income. As the below figure shows, savings (liquid assets or "cash-on-hand") increase strongly with income but only after a certain income threshold—roughly 25,000 Pesos per month (ca. 850 U.S. dollars). Poorer households own very little or no liquid assets. If there are any liquid savings, on average close to 80 percent of them are in the form of bank deposits. On average about 46 percent of household savings (if there are any) are in USD. Also, larger amounts are more likely to be saved in USD so that around 70 percent of the total value of savings is in USD. A corollary of this is that richer households tend to save a somewhat higher fraction of their income in U.S. dollars—doubling income leads to an increase in the fraction of savings in USD of roughly 0.13. However, even very low income households partly save in dollars if they save at all.

Real and illiquid assets

16. Close to 60 percent of households own their home. Out of those 60 percent, roughly 60 percent bought their home, while another 20 percent built it and the remainder inherited it or gained ownership through a gift. Only less than 10 percent of all households report currently paying down mortgage related debt, implying a large share of the population owns housing equity. Roughly 50 percent of households report contributing to a private pension (AFAP) account.

[13] The survey was conducted by the Economics department of the Universidad de la Republica. The design is based on the Bank of Spain's "Encuesta Financiera de las Familias espanolas" as well as the Bank of Italy's "Survey of Household Income and Wealth" and the Chilean Central Bank's "Encuesta Financiera de Hogares". The baseline sample is derived from the Uruguayen Statistic Institute's 2012 version of the continuous household survey (ECH-2012). Given the high concentration of wealth in Uruguay—as in other countries—the EFHU-2 survey over-samples very high income and wealth households. Using the appropriate survey weights, the data is representative of households in urban areas in Uruguay. See methodological guide ("Metodologia y guia para el usario EFHU-2) published in August 2016 for further details.

[14] See Lluberas and Odriozola (2015) for descriptive statistics on wealth and household balance sheets using EFHU-2. For household saving behavior in Latin America more broadly see IDB (2015).

Importantly, many household who own real estate or other illiquid assets (such as a private pension account) are 'cash-poor". For example, as many as 85 percent of households who own their house have no or very little liquid assets.

17. Consumer durables ownership is very wide spread. Less than 40 percent of households own their own car or vehicle and out of those who do, roughly 30 percent bought a new one in the last year. On the other hand, the very large majority of households own the following durables: computer and cellphone (86 percent), kitchen and other household appliances (99 percent) and video and audio equipment (90 percent).

Debt

18. Thirty five percent of households report having debt of some kind, including mortgage debt. For those households with debt, the median amount owed is roughly equal to 1.7 months of income and the mean amount owed is close to 3.5 months of income. Over 30 percent of households have some debt but no savings. Defining net wealth as the sum of housing equity + liquid savings—all debt, we find that 15 percent of households have negative wealth, 27 percent have zero net wealth and the remainder have positive net wealth.

Consumption

19. Unsurprisingly, the poorer the household, the higher the share of income spent on necessities. The median household spends 62 percent of his income on food, utilities, health and education, with food by far the largest component. Recall that only for households with income above roughly 25,000 Pesos did we start to see a significant positive relationship between savings and income. These are also the households who spend less than 50 percent of their monthly income on necessities. Lastly, about 65 percent of households reported spending all their income over the past 12 months, 16 percent spent more than their income and 19 percent spent less.

Implications

20. The above observations highlight several important features of consumers in Uruguay:

- **There exists a large number of HtM households in Uruguay.** Furthermore, a large fraction of HtM households are 'wealthy hand-to-mouth'—they own a sizeable amount of illiquid assets (eg housing or retirement accounts) but no liquid savings. Kaplan et al. (2014) define a "poor hand-to-mouth" household as one who has less than half a month of income of liquid assets and no illiquid assets whereas they define a household with the same liquid position but some illiquid assets as "wealthy hand-to-mouth". Using different potential measure for Uruguay we calculate that between 40 and 87 percent of households in Uruguay are HtM, with our preferred estimate

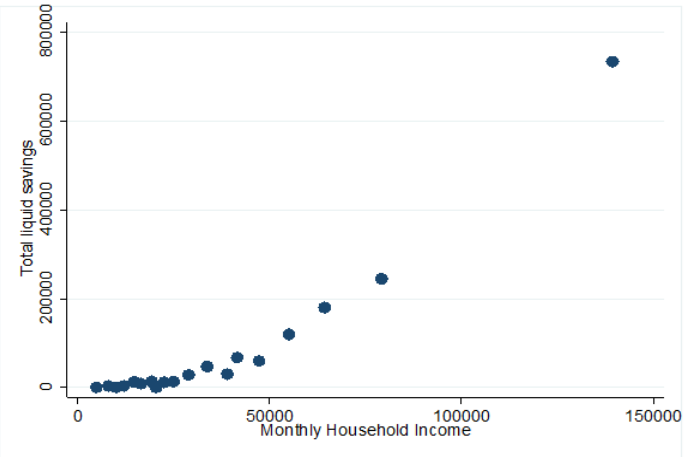
closer to the top of the range.[15] This compares to numbers around 30 percent for advanced economies.[16] Furthermore, we find that depending on which illiquid assets we count (housing equity or private pension accounts or both), between one half and four fifths of all HtM households are wealthy HtM.[17]

- **All households who save do so partly in dollars.** The share of dollar saving in total savings increases with household income.

- **Access to credit appears very limited with credit constraints likely binding for many households.** Note that average real interest rates on consumer loans tend to exceed 40 percent in Uruguay.

- **Households spend a large fraction of their income on necessities.** Cars seems to be unaffordable to a significant portion of households but household appliances and other smaller durables are consumed by virtually everybody.

Household wealth and income in Uruguay (in Pesos)



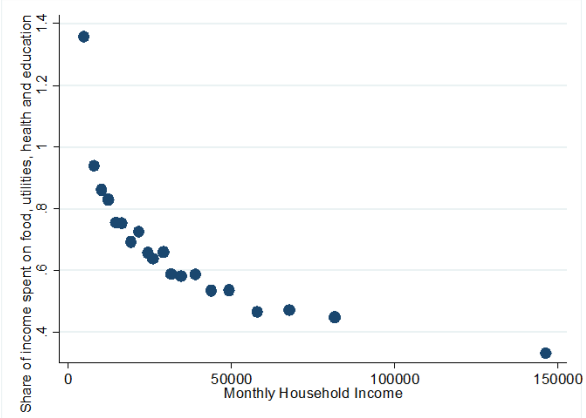
Source: IMF Staff calculations based on EFHU-2. Note: Graph shows scatter plot with observations clustered into twenty equal sized bins based on monthly household income where each dot represents mean monthly household income and mean total savings within one of the twenty bins.

[15] We calculate HtM status in two preferred ways. (i) based on the ratio of liquid assets to income and (ii) based on the response to a survey question which asks households whether they spent more, as much or less than their income over the past year. For this measure, HtM households are defined as those which consume as much or more than their income. For measure (i), note that we do not subtract any debt from liquid assets since we do not have a measure of credit card debt which is what Kaplan et al. (2014) use. In that sense our measure is a lower bound for the share of HtM households. We get to the 40 percent number when we only consider households with 0 or negative net total (rather than liquid) wealth as HtM.

[16] Kaplan et al. (2014) calculate the share of HtM households and the prevalence of wealth HtM households using survey data from the US, UK, Canada, Australia, Germany, France, Italy and Spain. Our numbers are not directly comparable to theirs given a somewhat less granular analysis in the present study but it is nevertheless clear that while HtM households make up a significant portion of the population in advanced economies, the fraction is much higher still in Uruguay.

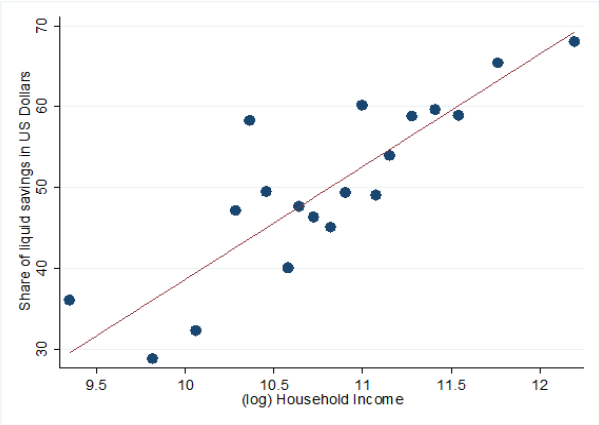
[17] For the U.S. the split is about 2/3—1/3.

Household income and spending on 'necessities' in Uruguay



Source: IMF Staff calculations based on EFHU-2. Note: Graph shows scatter plot with observations clustered into twenty equal sized bins based on monthly household income where each dot represents mean monthly household income and mean share of income spent on food, utilities, health and education within one of the twenty bins.

Dollar saving and household income



Source: IMF Staff calculations based on EFHU-2. Note: Graph shows scatter plot with observations clustered into twenty equal sized bins based on (log) monthly household income where each dot represents mean (log) monthly household income and mean share of savings in USD within one of the twenty bins.

D. A Simple VECM for Private Consumption

21. To investigate the aggregate relationship between the exchange rate and aggregate private consumption we estimate a simple vector error correction model (VECM). While we are primarily interested in verifying the existence of a short-run link between the exchange rate, real income and private consumption we estimate a VECM here to take into account the well-established long-run relationship between real income and consumption.[18] In later sections of the paper we will estimate VARs in first differences to focus exclusively on the short-run dynamics. In practice, results from the VECM and first-difference VARs are qualitatively the same, except that the VECM forces a certain degree of persistence in the effect of shocks due to the included long-run relationship. Note that we use the bilateral U.S. Dollar exchange rate rather than the nominal effective one, since the pass-through from the US dollar one is higher. This might be explained by wide-spread USD pricing even for imports from neighboring countries (see recent work by Boz et al, 2017).

22. Stationarity tests show that the series are I(1) and co-integrated with rank 1. We use augmented dickey-fuller tests to test for non-stationarity and cannot reject the null hypothesis for any of the series.[19] Johanson likelihood-ratio tests for co-integration indicate the presence of one co-integrating vector. Standard information criteria suggest 2 to be the optimal lag length. The VECM is identified using a Cholesky decomposition, with consumption being the most endogenous

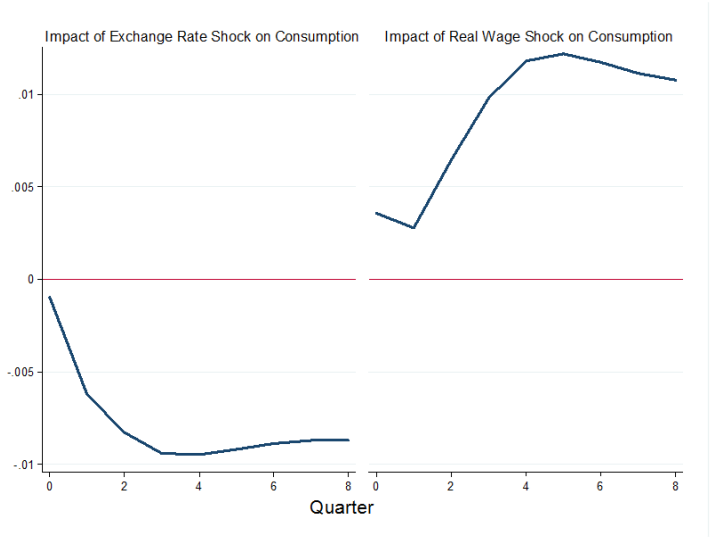
[18] Note that we do not have data on real disposable income but only a real wage index. This blurs the interpretation of results to some degree.

[19] Tests are done for the series with and without a linear trend.

variable. The preferred ordering is: $e_t \rightarrow y_t \rightarrow c_t$ but results are virtually invariant to the ordering.[20]

23. Private consumption increases as a reaction to a positive shock to real income and decreases following a positive shock (depreciation) to the exchange rate. The below figure plots the orthogonalized impulse-response functions for one-standard deviation shocks to real income and the exchange rate. Both shocks have the expected sign.[21] The results indicate a causal impact of the exchange rate on consumption both via real wages and directly.

Impact of Shocks on Consumption (from VECM)



Source: IMF Staff estimates. Note: Graphs show orthogonalized impulse response functions from a trivariate VECM (log private consumption, log real income index and log exchange rate).

E. The Impact of Exchange Rate Movements on Private Consumption: Exploring the Channels

Real income effects

24. The short-run pass-through of exchange rates to prices is estimated at around 15 percent. To calculate pass-through of exchange rate movements we estimate a simple infinite distributed lag model

[20] $e_t \equiv$ exchange rate, $y_t \equiv$ real income index, $c_t \equiv consumption$. We also estimate a larger model which includes 12-month interest rates and employment. Results become more sensitive to the ordering but the basic result on the impact on real income and the exchange rate on consumption remains. See Matheson and Goes (2017) for a similar VECM for consumption in Brazil.

[21] Note that the persistence of the impact of shocks is somewhat built-in to the analysis through the long-run relationship of the VECM where both real wages and the exchange rate enter significantly.

$$\Delta\pi_t = \alpha + \beta\Delta e_t + \rho\Delta\pi_{t-1} + \gamma O_t + \epsilon_t \quad \text{(I)}$$

where π is CPI inflation and we control for U.S. inflation and movements in international oil prices in O_t. All variables are specified as logarithms. Short-run pass-through is given by β while the long-run pass-through is given by $\frac{\beta}{(1-\rho)}$. Broadly in line with previous estimates for Uruguay (see, for example, IMF (2016)) we obtain a short-run pass-through of 16 percent and a long-run one of roughly 30 percent.[22]

25. Wages do not generally react within the same or even the next quarter, leading to a temporary loss of real income in case of a depreciation. This is true even though there used to be a high degree of backwards indexation of wages in Uruguay (less so after the 2015–16 wage negotiations). Re-estimating equation (I) with real wages as the dependent variable, we find a short-run elasticity of -13 percent, indicating minimal immediate reaction of nominal wages. Exchange rate movements thus impact real wages in Uruguay. And in a setting with a large fraction of HtM consumers such a transitory income shock impacts consumption.

26. Anecdotal evidence suggests that households often operate in USD savings targets, potentially leading them to increase their savings rate following a depreciation even if not liquidity constraint. If indeed households have dollar savings targets, then changes in the exchange rate impact the required savings rate (out of Peso salaries) to be able to reach the savings target. This could potentially be an additional channel which would lead non-liquidity constraint households to adjust consumption. However, it is not clear how much of an impact on required savings rates a temporary income shock would have.

Uncertainty and expectations of permanent income

27. We look at whether exchange rate movements might impact consumers' expectations of uncertainty or permanent income. There are several plausible hypothesis which link exchange rate movements to permanent income and uncertainty given that many exchange rate movements are driven by real sector shocks such as terms-of-trade shocks. For example, thinking about the recent (permanent) ToT shock which hit much of Latin America and which led to large depreciations of local currencies, agents could associate depreciations with a reduction in permanent income (and vice versa for appreciations). Similarly, Uruguay's history of crisis, which were accompanied by rapid depreciations, might lead households to associate appreciations with good times and depreciations with bad times. Expectations of lower permanent income or perceptions of higher uncertainty would then lead consumers to lower consumption today in the standard macro-consumption framework.

28. We 'purge' exchange rate movements from real sector shocks by controlling for terms-of-trade movements and find that the residual variation in exchange rates still matters for private consumption. To do so we estimate a trivariate VAR which includes terms of trade movements, exchange rate movements and private consumption growth, with the terms-of-trade

[22] As we will see below there is huge heterogeneity in terms of pass-through by good.

ordered first and the exchange rate second in the Cholesky decomposition. The forecast-error decomposition shows that shocks to the exchange rate not driven by terms-of-trade movements still account for 22 percent of the variation in private consumption growth. We also find that terms of trade shocks only account for 15 percent of the variation in exchange rate movements. Taken together this offers some suggestive evidence that exchange rates movements are not simply a proxy for real sector shocks.

29. We also use data from the consumer confidence survey and find no indication for an impact of the exchange rate on proxies for uncertainty or expected permanent income once other factors are controlled for. We use survey data on households' assessment and outlook for their personal situation and their outlook for the country's situation to proxy for expectations of uncertainty or permanent income.[23] We find that current real wages are the key determinant of households' perceptions of their personal economic situation. The interest rate on the other hand influences perceptions of the country's economic situation. The exchange rate, however, does not influence perceptions of either the personal or the country's economic situation.[24]

Determinants of consumer confidence components

VARIABLES	(1) Personal Situation	(2) Country's Situation	(3) Intention to buy Durables
Employment (SA, %)	1.088	0.650	1.769
	(0.763)	(1.311)	(1.080)
Real Wage Index	1.140***	0.418	-0.163
	(0.362)	(0.555)	(0.445)
Peso/USD Exchange Rate	-0.0824	0.395	-2.195***
	(0.250)	(0.426)	(0.387)
Interest Rate (12 months)	-0.133	-0.810**	-1.182***
	(0.230)	(0.301)	(0.304)
Constant	117.2*	111.6	-38.48
	(61.73)	(107.4)	(82.37)
Observations	39	39	40
Linear Time Trend	Yes	Yes	Yes
R-squared	0.543	0.409	0.864

Source: IMF Staff estimates. Note: Table shows estimated coefficients from OLS regressions of consumer confidence indicators or various macroeconomic variables. A linear time-trend is included in the regressions. Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Relative price effects and the consumption of durables

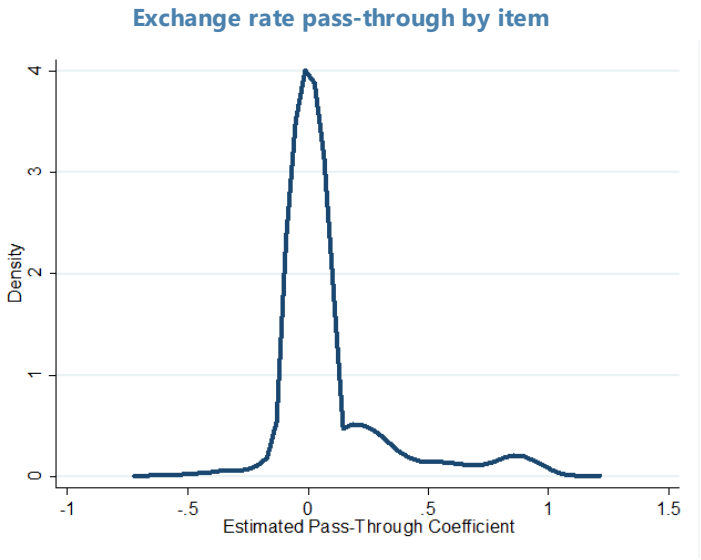
30. Intentions to buy durable goods, the third element of the consumer confidence survey, are very strongly related to the exchange rate. In this section we analyze the link

[23] We include a time trend in the regressions so that the exchange rate coefficient can be interpreted as the reaction to a deviation from the expected trend. As noted before, this is relevant given that the Peso tends to slowly trend-depreciate against the USD and agents expect it to do so.

[24] When we exclude real wages from the regression in column 1, the coefficient on the exchange rate becomes significant, again indicating that the income channel of exchange rate movements is indeed relevant.

between durable consumption and the exchange rate in more detail and argue that the relative increase (decrease) in durables prices brought about by a depreciation (appreciation) is key for understanding the impact of exchange rate movements on consumption.

31. As a first step it is worth noting that about 14 percent of the CPI basket are quoted in USD in Uruguay and that the overwhelming part of these goods are durables with a very high exchange rate pass-through. To see the high pass-through consider the below figure which shows the distribution of estimated short-run pass-through coefficients for all goods in the CPI basket. The majority of items have a very low pass-through, indeed often not significantly different from zero. On the other hand, there is a small mass of items which have a pass-through close to 1—precisely the durables mentioned previously (households appliances, cars, etc.).[25] When we estimate pass-through by group of item (tradable and durable, tradable and non-durable and non-tradable) we find that the estimated pass-through for both the latter two groups is not statistically significantly different from zero.



Source: IMF Staff Estimates. Note: Figure shows estimated pass-through coefficients for all goods in the CPI basket.

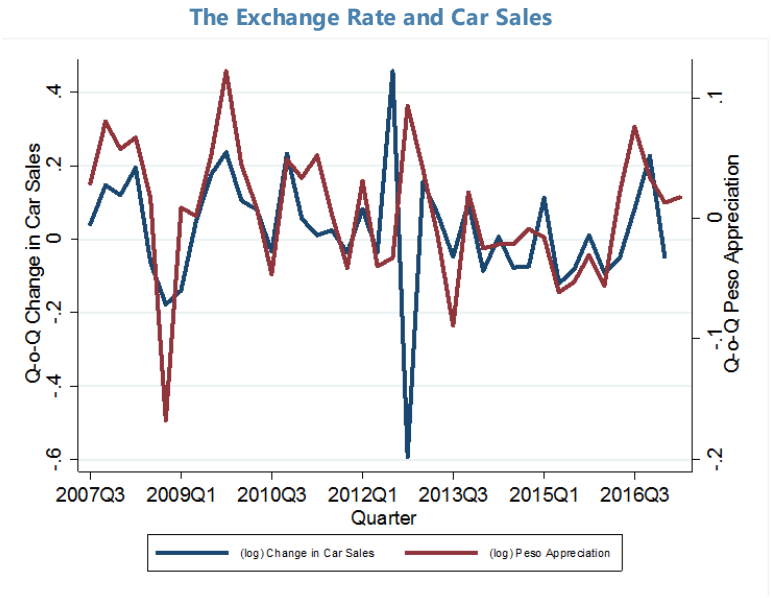
32. Exchange rate movements thus have important implications for relative prices. Clearly, relative prices between durables and the rest of the consumption basket change with the exchange rate. Additionally, as long as exchange rate movements are perceived to be temporary (we control for a linear time trend, so that exchange rate movements can be seen as deviations from trend), there is a change in relative durables prices today versus durables prices in the future.

33. Indeed, durable purchases in Uruguay are highly influenced by exchange rate (and thus price) movements. Plotting the two shows just how closely sales of cars are aligned with

[25] The Appendix shows a table with pass-through by item for those items in the right tale of the pass-through distribution. The appendix also lists all USD-quoted goods and services which are part of the CPI.

exchange rate movements on a quarterly basis. Car sales track the exchange rate in virtually every quarter of the sample.

34. It is not possible to formally assign weights to the real wage effect and the intertemporal substitution effect in terms of their importance for private consumption movements. While we find tentative evidence for both, it is hard to rule out that it is 'only' the real income effect which causes changes in durable (and overall) consumption or that 'only' intertemporal substitution of durables is responsible. The key to be able to comment further would be more disaggregated data, notably more disaggregated consumption data.



Source: IMF Staff calculations. Note: Figure shows co-movements between the exchange rate (de-trended) and car sales.

Wealth effects

35. Exchange rate movements also have direct wealth effects given the high dollarization of assets. This effect is of the opposite sign relative to the other effects discussed previously—depreciations increase the value of dollar assets. For households with a significant fraction of savings in USD this could potentially provide a substantial boost to real wealth.[26]

36. It is not possible to fully explore this channel, but at least the impact on liquid wealth appears small. As discussed previously, few households have liquid savings so that liquid wealth effects will only impact a small segment of the population—what is more, it would impact only the wealthiest segment of the population which is likely to have the lowest MPC. Indeed, Lluberas and Odriozola (2015) simulate the wealth implications of exchange rate movements based on data from

[26] Hedging against exchange rate and inflation shocks is of course one of the key reasons for households to hold dollar assets.

the 2014 EFHU-2 and find that even very large movements of over 50 percent have only small implications for the distribution of wealth. Taking into account illiquid assets complicates the analysis, given that a much larger share of the population own illiquid assets and houses are generally valued in USD. Unfortunately, without more data we are not able to dig any deeper—we can only observe that if wealth effects exist, they are not strong enough to offset the income and substitution effects.

F. Macro-Implications: GDP, Volatility of Consumption and Concluding Thoughts

The implications for GDP

37. Thinking more broadly about the link between exchange rate movements and GDP, the baseline view in much of macro is that exchange rate depreciations tend to be expansionary. The standard channel refers to expenditure switching effects, whereby exchange rate movements stimulate a move away from imports and towards domestically produced goods, while at the same time stimulating exports.

38. Following Krugman and Taylor (1978), among others, the possibility of contractionary depreciations has also been acknowledged. The mechanisms which can lead to a contractionary effect include a consumption channel such as the one we investigate in this paper—redistribution of income to agents with a low marginal propensity to consume, for example a rise in profits at the cost of real wages—or negative balance sheet effects in the presence of FX liabilities (see, among others Moreno (1999), Kandil et al (2007) and IMF (2009)). The consumption channels we highlighted in this paper will negatively affect GDP unless the overall fall in consumption is fully offset by a substitution away from imports.

39. Data from Input-Output tables show that Uruguay produces a non-trivial amount of the tradable, durable goods it consumes, opening the door to contractionary depreciations. Recall that tradable durables are the goods with by far the biggest relative price changes following exchange rate movements and they are likely to be driving most of the fall in total consumption. If all these goods were imported, then the impact on GDP might be modest at most. The below table uses the latest available (2013) Input-Output table in constant 2005 Pesos to highlight that while the majority of durable goods are imported, the domestic share is non-trivial. For furniture, it is as high as 40 percent, for example.

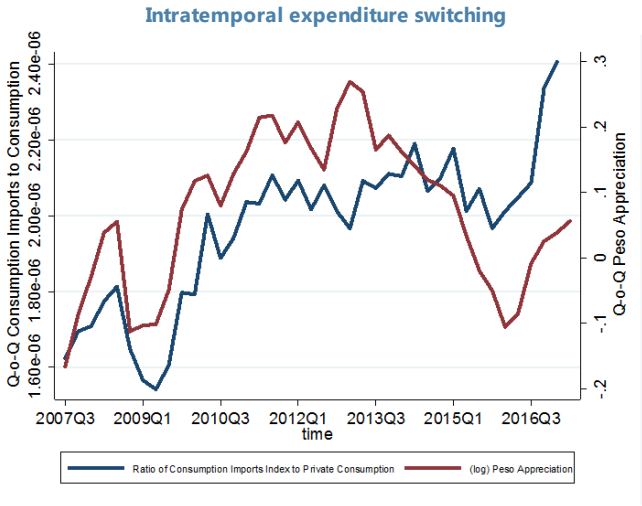
Durable and Storable Goods in Input-Output Tables

Data from 2013 Partial Input-Output Table Uruguay	Share of sector in total household consumption	Share of Supply which is domestic	Share of Household consumption in final demand
Metals, machines and electronic products such as TVs and Radios	4%	19%	18%
Cars and other vehicles	4%	15%	40%
Clothing	4%	38%	91%
Furniture	2%	43%	54%

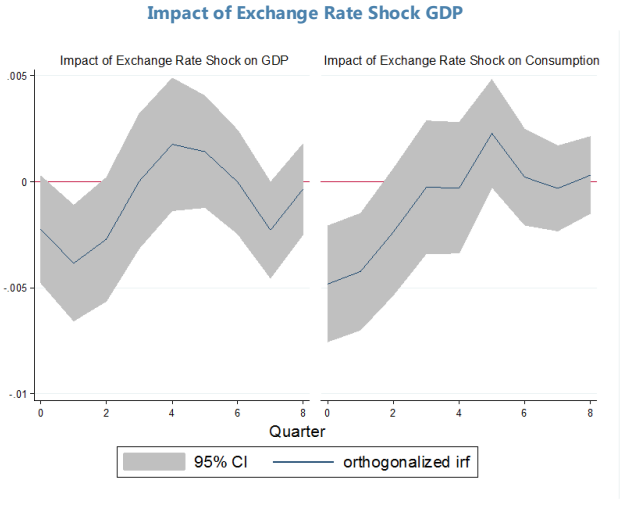
Source: IMF Staff calculations. Note: Table shows domestic content in durables consumption in Uruguay using 2013 Input-Output tables (in constant 2005 Pesos).

40. Intratemporal substitution between imported and domestically-produced goods is non-neglible which should limit the adverse effect on demand. The below figure shows that there is at least some substitution, however, as would be expected. The ratio of imported consumer goods to total consumption expenditures increases when the exchange rate appreciates and falls when it depreciates[27]. At the very least, the effect of lower total consumption is thus partially attenuated by lower imports.

41. When including GDP in the VAR analysis we find a negative association between depreciations and GDP growth. Specifically, we add the growth rate of GDP to the trivariate VAR used in section E (which included the growth rate of private consumption, terms of trade and de trended exchange rate) and recover the orthogonalized impulse response functions shown in the bottom figure. The results show that GDP is negatively impacted by exchange rate movements but quantitatively somewhat less so than private consumption. Both GDP and private consumption are negatively affected in the contemporaneous quarter and the next but after that the impact is not statistically significantly different from zero. We do not attempt to fully explore the channels through which exchange rate movements impact GDP—for example, we have not commented at all on the reaction of exports—but finding a negative aggregate relationship highlights the importance of the consumption channel which we explored in this paper. Finding a smaller quantitative impact for GDP than private consumption additionally suggests that there is some offset—import substitution is a likely candidate as a countervailing force.



Source: IMF Staff Calculations. Note: Figure shows co-movements between the exchange rate (de-trended) and the ratio of the consumption goods import index and total private consumption (in constant 2005 pesos). The level of the ratio cannot easily be interpreted since the units of the nominator and denominator are unrelated.



Source: IMF Staff estimates. Note: The underlying VAR includes the change in (log) GDP, (log) private consumption, (log) terms of trade and de-trended (log) exchange rate. Shocks are identified using a Cholesky decomposition with terms of trade ordered first, followed by the exchange rate, private consumption and GDP last.

[27] Note that the magnitude of the ratio cannot be easily interpreted since the nominator is an index of consumer goods imports while the denominator is private consumption in constant 2005 Pesos.

Excess volatility of consumption in emerging markets—a potential explanation for Uruguay

42. It is a well-known fact that volatility of consumption in emerging markets is higher than in advanced economies (Alvarez-Parra et al., 2013). In addition, consumption expenditure volatility in emerging markets tends to exceed that of income—the so-called "excess volatility of consumption puzzle" (Aguiar and Gopinath, 2007). However, once durable consumption is excludedthis is not true anymore (Alvarez-Parra et al., 2013).[28] For Uruguay, the ratio of the standard deviation of quarterly consumption to the standard deviation of quarterly GDP (calculated following the methodology[29] of Alvarez-Parra et al. (2013) is 1.28. This is towards the higher end of the emerging markets sample and above the average of 1.14 calculated in their paper.

43. Alvarez et al. (2013) suggest that counter-cyclical interest rates which drive durables consumption are key to explaining excess volatility of consumption in emerging markets. In a standard RBC setup frequent persistent shocks to productivity are needed to explain excess volatility of consumption (Aguiar and Gopinath, 2007). But Alvarez et al. (2013) show that introducing durable consumption combined with financial frictions into a RBC model reduces the need for frequent productivity trend shocks. Their mechanism runs from a counter-cyclical level of interest rates (financial frictions lead to counter-cyclical risk premia) to pro-cyclical durables consumption (taking advantage of low rates during expansions) and finally to counter-cyclical trade balances (another salient feature of emerging markets).

44. Volatile nominal exchange rates and thus volatile durable consumption (even without counter-cyclical risk premia) could offer a related but complementary explanation. The evidence in the present paper suggests that in the case of Uruguay, the exchange rate could be an alternative mechanism for explaining volatility of expenditures on durables. Access to household credit is very limited, reducing the impact the interest rate can have in Uruguay. On the other hand, the evidence presented in this paper suggests that volatile exchange rates could be a key driver for consumption volatility.[30]

[28] Also see Obstfeld and Rogoff (1996) for the basic point that durable goods increase current account volatility.

[29] Variables are in logs and de-trended using an HP filter. The ratio of volatilities for the de-trended series in Uruguay is 1.14.

[30] The two mechanisms are potentially observationally equivalent if exchange rate movements lead to interest rate movements to satisfy interest rate parity. In the mechanism here proposed the nominal exchange rate would need to be an exogenous parameter. Anecdotal observations for Uruguay does not make it seem unlikely though that global factors are a key driver of the Peso.

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Appendix I. Additional Material and Data Sources

Macroeconomic data

We use data from Q1 2005 to Q1 2017 in the analysis.

Real Private Consumption: Quarterly data are from the national accounts provided by the Uruguayan Central Bank (BCU). We seasonally adjust the data using the Census Bureau X-13 method.

Seasonally adjusted real GDP: Quarterly data are from the BCU.

Exchange Rate: The quarterly bllateral Peso-US Dollar exchange rate is taken from Haver. For much of the analysis we detrend the series by regressing it on a time trend and working with the residuals of that regression.

Real and nominal wages indices: Monthly data are taken from the national statistics institute (INE). We average the data by quarter to obtain quarterly data.

CPI index and price indices by good: Monthly data taken from INE. We average the data by quarter to obtain quarterly data.

Employment: Quarterly employment rate provided by INE. The data are seasonally adjusted by Haver.

Consumer confidence index and sub-indices: Monthly data from Universidad Catholica de Uruguay. We average the data by quarter to obtain quarterly data.

12-month interest rate: Data taken from BCU.

Import volume index and sub-indices: Data taken from BCU.

Car Sales: Monthly data taken from Asociación del Comercio Automotor del Uruguay and then seasonally adjusted and summed over the quarter.

Household Finance Survey (EFHU-2)

We only work with the raw non-imputed data for the 3490 households which participated in the survey. The number of responses varies by households. Generally, when a household did not reply to a specific question we simply exclude it from that part of the analysis. In the following paragraph we outline key data manipulations.

Total liquid savings: To calculate summary statistics on liquid savings we used the responses to the question which asks households to give an estimate of their total savings. If a household reported in a separate question that that they do have some savings but didn't give an estimate, that household

is excluded. If a household reported not having any savings, we impute a 0 for the estimate of their total liquid savings.

USD and Peso liquid savings: To calculate the value of Peso and Dollar savings, we take the reported answers to the questions which ask what fraction of savings are in USD and Peso, respectively, and multiply it with the total liquid savings number.

Consumption: To calculate the share of income spent on essentials we take sum estimated monthly spending on food, utilities, health and education and divide it by reported total household income.

List of USD quoted prices

Item	Weight in CPI Basket	Item	Weight in CPI Basket
Air conditioning	0.0%	Home insurance	0.1%
Armchair	0.1%	Hotel	0.4%
Bed	0.1%	Jeans	0.3%
Bed Sheets	0.2%	Kitchen	0.1%
Bicycle	0.0%	Kitchen furniture	0.1%
Car	1.2%	Lawyer's services	0.2%
Car battery	0.2%	Lighting appiances	0.0%
Car cavor	0.2%	Living room set	0.1%
Car insurance	1.5%	Mattress	0.3%
Car rental	0.1%	Motorcycle	0.3%
CD player	0.1%	Motorcycle accessories	0.0%
CDs	0.1%	Pan	0.1%
Cellphones	0.3%	Post	0.1%
Childrens' bicycles	0.1%	Postgraduate education	0.1%
Compuer desk	0.1%	Printer cartridges	0.0%
Computer	0.2%	Printing paper	0.0%
Digital photcamera	0.0%	Quilts	0.1%
Dining room set	0.1%	Rent of primary residence	3.7%
Drill	0.1%	Television	0.1%
DVD player	0.1%	Toys	0.1%
Electric lamps	0.1%	Vehicle repair	1.1%
Excursions	0.4%	Wardrobe	0.1%
Flight tickets	0.4%	Washing machine	0.1%
Fridge	0.2%	Water heater	0.1%
Glasses	0.3%		13.7%

Source: INE. The table shows all items which are part of the CPI basket which are quoted in US Dollar.

List of goods and services with highest exchange rate pass-through

Item	Pass-Through Estimate	USD Quoted?	Durable?	Tradable?
DVD Player	0.99	Yes	Yes	Yes
Motorcycles	0.97	Yes	Yes	Yes
Home insurance	0.93	Yes	Yes	No
Flight tickets	0.92	Yes	No	No
Equipo fotográfico, cinematográfico e instrumentos ópticos	0.91	Yes	Yes	Yes
Equipos para fotografía y video	0.91	Yes	Yes	Yes
Digital camera	0.91	Yes	Yes	Yes
Car	0.91	Yes	Yes	Yes
Fridge	0.91	Yes	Yes	Yes
Washing machine	0.89	Yes	Yes	Yes
Aire acondicionado	0.89	Yes	Yes	Yes
Computadoras personales	0.89	Yes	Yes	Yes
Kitchen	0.86	Yes	Yes	Yes
Computer	0.85	Yes	Yes	Yes
Flank steak	0.83	No	No	Yes
Excursions	0.82	Yes	No	No
Hotel	0.80	Yes	No	No
Car Cover	0.80	Yes	Yes	Yes
CD Player	0.79	Yes	Yes	Yes
Television	0.77	Yes	Yes	Yes

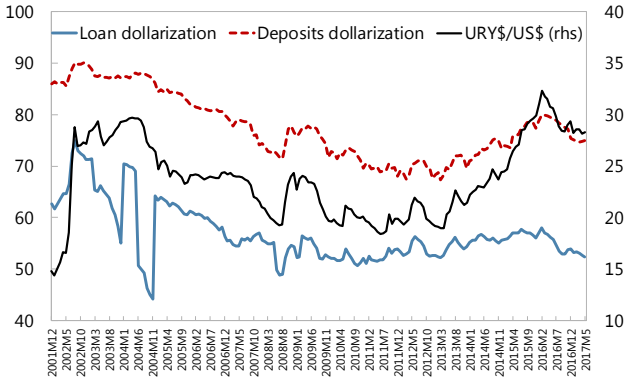
Source: IMF Staff estimates. Note: The table shows the twenty individual items with the highest estimated pass-through. Groups of goods, such as household appliances, would also feature in the list but since the individual subcomponents (such as fridge and washing machine) are already included, the aggregated groups are excluded. One good (pumpkin) has an estimated pass-through above 1 – after closer inspection the association appears spurious and to pumpkins are not included in the list.

NEXT STEPS FOR PROMOTING DE-DOLLARIZATION IN URUGUAY[1]

1. Uruguay has a long history of financial dollarization. Between December 2001 and May 2017, credit dollarization in Uruguay averaged 57 percent, with a peak of 75 percent during the crisis in 2002, while deposit dollarization averaged 78 percent, peaking at 90 percent in 2002. The latest data (from mid-2017) show a slight dip in both credit and deposit dollarization—to 52 percent and 75 percent, respectively—relative to the historical average as well as to levels observed in early 2016 (57 percent and 79 percent, respectively). This paper highlights key findings of empirical studies on de-dollarization, and lessons from the case of Peru, in an attempt to explore what measures Uruguay could take to advance the process of de-dollarization.

2. Many studies have found macroeconomic stabilization, especially lower inflation, to be a necessary ingredient for de-dollarization. Empirical work by Kokenyne et al (2010), Garcia-Escribano and Sosa (2011), Rodriguez and Manookian (2014), and Catao and Terrones (2016), all depicted that solid macroeconomic fundamentals, particularly by way of low and stable inflation and fiscal deficits, were prerequisites for lowering dollarization levels. In addition, Escribano and Sosa, and Catao and Terrones found that nominal appreciation of the exchange rate was also a strong contributor to de-dollarization, particularly for deposits; a trend that can be clearly mapped and confirmed in the case of Uruguay (see chart).

Uruguay: Dollarization and the Exchange Rate
(Percent of total)



Sources: BCU and Fund Staff calculations.

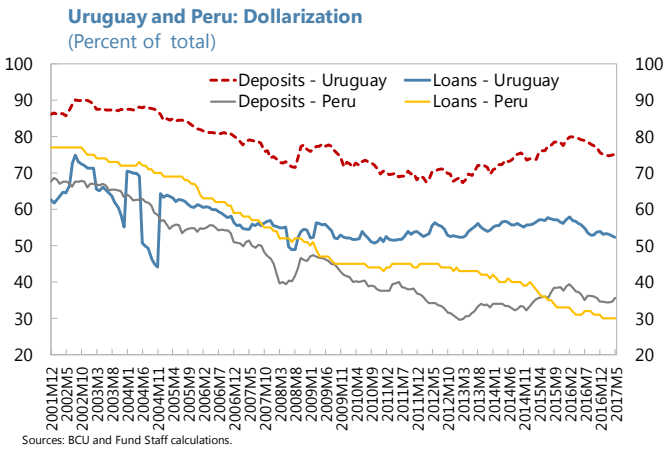
3. However, necessary does not imply sufficient; additional policies are likely needed to drive de-dollarization, on top of sound macroeconomic fundamentals. Multiple studies, including those mentioned above, have found that dollarization is a persistent phenomenon and can remain entrenched even after countries have stabilized their economies and inflation has come down. In order to successfully de-dollarize, complementary policies must be put in place once macroeconomic fundamentals are conducive. In particular, these studies contend that macroprudential policies that help internalize the risks of dollarization, and the development and deepening of local currency capital markets, can help in the process.

4. In the case of Peru, for example, it took a series of prudential, supervisory, and "forced" de-dollarization policies, to complement the macroeconomic environment, and successfully de-dollarize. Between 2001 and 2012, deposit dollarization in Peru decreased from 67 percent of total deposits to 35 percent, while credit dollarization was reduced from 77 percent of

[1] Prepared by Diva Singh.

total loans to 45 percent. Today, deposit dollarization remains at 35 percent, while credit dollarization has dropped further to 30 percent. Peru's road to de-dollarization did not happen overnight. Prudential policies to better internalize the risks of dollarization were put in place in the 1990s (such as higher reserve requirements and more stringent liquidity requirements on foreign currency deposits). In addition to these, between 2000–05, the Peruvian authorities introduced a requirement for prices of goods and services to be listed in domestic currency. These measures, together with the introduction of inflation targeting in 2002 and the development of the domestic capital market, all played a role in the gradual de-dollarization of the Peruvian economy—which, until today, *still* depicts relatively high financial dollarization.

5. Macroeconomic fundamentals in Uruguay now appear to be ripe for a push towards de-dollarization. Inflation has decreased and remained within the BCU's target band for several months, while the nominal exchange rate has enjoyed a steady appreciation since May 2016. In addition, the authorities have taken advantage of favorable market conditions to further develop the peso debt market, with landmark issuances of nominal peso bonds in global markets this year at medium term tenors.



Sources: BCU and Fund Staff calculations.

6. More could be done on the microeconomic and prudential regulatory front to capitalize on current conditions in favor of de-dollarization. Uruguayan authorities could do more to help foster de-dollarization by implementing macroprudential regulations that better internalize foreign exchange risks and other market policies.

- For example, higher reserve requirements (RRs) and lower remuneration on foreign exchange relative to local currency deposits at the central bank (since April 2016, RRs on local currency and foreign exchange have been equivalent), together with higher provisioning and capital requirements on foreign exchange loans, could help internalize the costs of dollarization.

- In addition, similar to Peru and other countries, the authorities could consider stipulating the mandatory listing of prices (and potentially even transacting) of goods and services in local currency. Even if payments continued to be permitted in foreign exchange, listing the prices in local currency could start the long process of de-dollarizing the "mentality" of agents.

- Further development of the domestic capital market to increase opportunities to invest in local currency-denominated securities, including through the establishment of a well-functioning secondary market, and the development of derivatives instruments to hedge interest rate risk, would also help.

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URUGUAY: ESTIMATES OF FISCAL MULTIPLIERS[1]

Fiscal multipliers are estimated for Uruguay using VAR models and local projection (LP) method. The results suggest that government consumption has only short-term output effects with cumulative multipliers of less than one and vanishing within five years whereas government investment has longer effect with multipliers steadily increasing to levels above two. On the other hand, tax shocks appear to have a negative short-term impact on output with impact multipliers between 0 and -1 and dissipating within two years.

A. Introduction

1. Fiscal multipliers measure the short-term impact of discretionary fiscal policy on output. They are usually defined as the ratio of a change in output to a discretionary change in government spending or tax revenue. Multipliers are expected to depend on country characteristics, and be lower with openness to trade, labor market rigidity, exchange rate flexibility, and high debt levels or in case of full employment (Batini and others, 2014).

2. The literature on fiscal multipliers suggests that first year multipliers generally lie between 0 and 1, and are higher in advanced economies (AE) than in emerging market economies (EMEs) and low-income countries (LICs). By looking at different studies, Mineshima and others (2014) show that first-year multipliers in AEs are on average 0.75 for government spending and 0.25 for government revenues. Due to factors such as expenditure inefficiencies, the limited empirical works available suggest multipliers are smaller in EMEs and LICs than in AEs (Estevão and Samake, 2013; Ilzetzki and others, 2013; Ilzetzki, 2011; and Kraay, 2012).

3. Beyond the first year, the persistence of the fiscal multipliers may differ depending on the fiscal instrument used. In case of indirect taxes, government consumption, and transfers, the model-based literature shows that permanent discretionary changes have only short-lived output effects (Anderson and others, 2013; Coenen and others, 2012). In contrast, permanent discretionary changes in public investment or corporate taxes have longer effects on output with multipliers steadily increasing to their long-term values (Coenen and others, 2012).

4. Uruguay is in the middle of a fiscal consolidation. When the current government took office in 2015, it set out a five-year budget plan that envisaged a reduction in overall fiscal deficit from 3.5 percent of GDP in 2014 to 2.5 percent of GDP in 2019 and an improvement in the primary balance of 1.6 percent of GDP. Half of this improvement has been expected to come from a reduction in current and capital expenditures whereas about one-fifth from higher central government revenues with the rest mainly coming from profits of public enterprises. The progress towards the set goals is proceeding with an estimated 3.3 percent of GDP overall fiscal balance in 2017.

[1] Prepared by Yehenew Endegnanew.

5. Estimation of fiscal multipliers for Uruguay could give important insights in the context of the ongoing fiscal consolidation. Previous studies that estimate fiscal multipliers for Uruguay are scarce. In that regard, this paper contributes to the discussion about the short- to medium-term possible adverse effects of the fiscal consolidation by looking at the different fiscal instruments at the disposal of policy makers and their impacts on output.

6. The paper is organized as follows. In section B, we discuss the vector-autoregressive model (VAR) models and local projection (LP) method used to estimate fiscal multipliers. We present estimates of government spending and revenue multipliers in section C and check robustness of the results in section D. In the final section, we make some concluding remarks.

B. Methodology

7. We apply VAR models and local projection (LP) method (Jorda, 2005) to estimate fiscal multipliers for Uruguay. While VAR models are the conventional methodology in the literature, the LP method has become prominent in recent times. Using the two methods in conjunction not only enriches the analysis, but also strengthens the results and policy implications.

8. Our data ranges from 1999Q1 to 2017Q2. We use seasonally adjusted quarterly data for GDP and the fiscal variables that are converted into real terms using the CPI deflator. The fiscal variables include government consumption, government investment and tax revenues. In all analysis, government consumption excludes interest payments[2], tax revenues are cyclically adjusted and changes in log of real effective exchange rate (REER) are used as control variables. Data sources for the variables are Haver and the Central Bank of Uruguay.

9. As our baseline, we use VAR models to estimate fiscal multipliers for government consumption, government investment and tax revenue. The reduced form VAR specification is:

$$Y_t = a + D(L)Y_{t-1} + u_t$$

Where a is a constant, Y_t is a three-dimensional vector of endogenous variables, $D(L)$ is an autoregressive lag polynomial and u_t is the reduced form residual. Y_t consists of the fiscal variable (government consumption, government investment or tax revenue), GDP and changes in REER. Lag length is set to be 2 based on AIC, SBC and LR test.

10. We follow the Blanchard and Perotti (2002) identification, which assumes that the fiscal variables are not affected by shocks to GDP within the same quarter. Although this assumption is straightforward for government spending components, it requires cyclical adjustment in case of revenues.

[2] Interest payment is excluded since the government has limited discretionary control over it.

11. Alternatively, we use Jorda's (2005) LP method to compute estimates of multipliers for Uruguay. The method entails the estimation of a series of regressions for each horizon h, such that:

$$x_{t+h} = a_h + D_h(L)z_{t-1} + b_h\, shock_t + e_{t+h}, \text{ for } h=0,1,2, \ldots$$

Where x is the variable of interest (GDP or the fiscal variable), z is a vector of control variables (which includes in our case two lags of the fiscal variable, GDP and changes in the real effective exchange rate), $D_h(L)$ is a polynomial in lag operator and "shock" is the identified shock to the fiscal variable. The coefficient b_h is the response of x at horizon $t+h$ to the shock at time t.

12. Employing the Blanchard and Perotti (BP) identification to the LP method gives same contemporaneous responses of output to fiscal shocks as are derived through the VAR models. Since the set of controls, z, includes lagged measures of GDP, the fiscal variable and changes in REER, with BP identification, the shock is simply given by current value of the fiscal variable. However, when we extend the horizon the impulse response functions are constructed differently. For the LP method, these are sequence of b_h estimates in a series of single regressions for each horizon whereas for VAR models, they are iterated forward from the estimated parameters of the VAR for horizon 0.

13. For both the VAR models and LP method, we use variables normalized by trend GDP obtained using HP. The usual practice of using the log of the variables would require converting the estimated elasticities by the sample average of the ratio of GDP to the fiscal variable to obtain multipliers. However, Ramey and Zubairy (2016) show that the variability of this ratio in time biases the multiplier estimates, usually upwards. To avoid this bias, we divide all the variables by an estimate of trend GDP and express them in the same units, thus directly estimating the multipliers.

14. Following Ramey and Zubairy (2016), we compute cumulative multipliers as the cumulative of the output response divided by the *cumulative* of the fiscal variable response. Many papers define multipliers as the ratio of the output response to the *initial* fiscal variable shock. However recent literature[3] argues multipliers should instead be calculated as ratio of the integrals of the output response to the fiscal variable response because the integral multipliers address directly the policy question of measuring the cumulative GDP gain relative to the cumulative spending during a given period (for example, a budget year).

C. Empirical Results

15. We estimate fiscal multipliers for government consumption, government investment and tax revenues using the VAR models and the LP method. In general, the estimated multipliers are broadly similar across the two approaches for Uruguay (text table). Figure 1 presents cumulative orthogonalized impulse responses over 20 quarters to the different fiscal shocks from the VAR

[3] See Mountford and Uhlig (2009), Uhlig (2010), Fisher and Peters (2010) and Ramey and Zubairy (2016).

models. Caution is warranted when interpreting the results since the confidence bands are wide in most cases.

Uruguay: Estimates of Fiscal Multipliers (cumulative)

	VAR Model			LP Method		
	Government Consumption	*Government Investment*	*Tax Revenue*	*Government Consumption*	*Government Investment*	*Tax Revenue*
Impact	0.32	0.71	-0.61	0.32	0.71	-0.61
1 year	0.29	1.94	-0.35	0.66	3.14	-0.26
2 year	0.15	2.40	-0.13	0.55	2.38	0.66
5 year	-0.05	2.65	0.11			

Source: Staff estimates

16. Government consumption has only short-term output effects with multipliers less than one and vanishing within five years. As expected, output responds positively to government consumption shocks, but the effect dies out within the first few years. Looking at the estimates of the multipliers computed from the VAR models and LP method, the impact multipliers for government consumption are less than one, reach their peak at the second or third quarter and dissipate afterwards. The government consumption multipliers for Uruguay are in line with the estimates obtained for Paraguay (David, 2017) and slightly higher than the ones for Peru (Vtyurina and Leal, 2016).

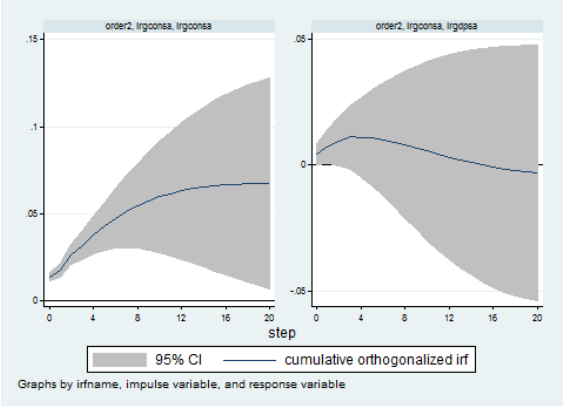
17. Government investment has longer effect on output with multipliers steadily increasing above two. Impulse response analysis shows that output responses are more persistent to government investment shocks. Both the VAR models and LP method suggest that while impact multipliers for government investment are less than one, they tend to increase gradually through time and reach levels above two. These results are similar to the government investment multipliers obtained for Paraguay (David, 2017) that increase from 0.1 to 2.1 in 5 years and for Peru (Vtyurina and Leal, 2016) that reach from 0.5 to 1.1 in 3 years.

18. Tax revenue shocks have negative short-term impact on output. The impulse responses from the VAR and LP models point to a negative response of output to tax revenue shocks in the short run. The impact multipliers implied by these impulse response functions and the LP method are between 0 and -1. Under the VAR model, the impact vanished within two years, whereas the LP method shows this effect switching to positive numbers after a year or so. While the impact tax revenue multipliers compare well with the ones estimated for Brazil (Matheson and Pereira, 2016), Paraguay (David, 2017) and Peru (Vtyurina and Leal, 2016), their short persistence differs from the constant or increasing magnitude in tax revenue multipliers obtained in these countries.

Figure 1. Cumulative Orthogonalized Impulse Responses to Fiscal Shocks (VAR models)

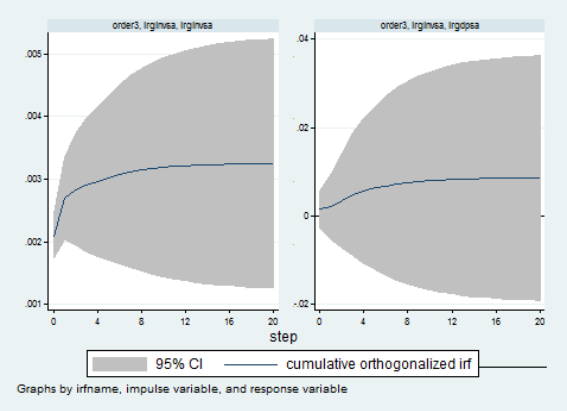
Responses to government consumption shock

government consumption *GDP*



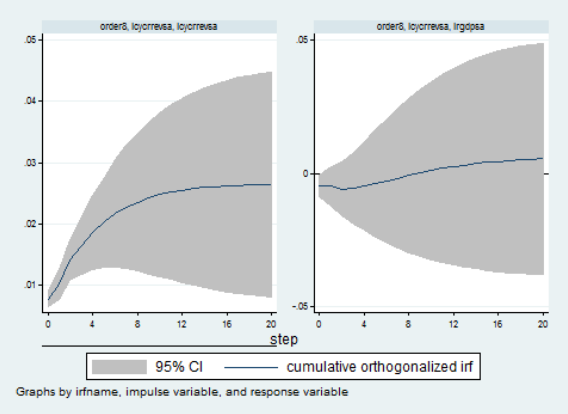
Responses to government investment shock

government investment *GDP*



Responses to tax revenue shock

tax revenue *GDP*



Source: Staff estimates

D. Robustness

19. We undertake some robustness checks around the baseline specification. We re-estimate alternative models in which the GDP deflator is used instead of the CPI deflator to convert nominal variables and/or where changes in nominal exchange rates are used rather than changes in REER. We use both the VAR models and the LP method under these robustness check specifications.

20. The results from the robustness exercises (not shown) are in line with the baseline specifications. They confirm the main findings that government investment multipliers are larger than government consumption and tax revenue multipliers, and that government consumption and tax revenue shocks have short-term impact on output whereas government investment shocks have much longer one.

E. Concluding Remarks

21. Uruguay is making progress towards reaching its overall fiscal deficit target of 2.5 percent of GDP in 2019. Attaining the deficit target is important to maintain public debt sustainability, improve investor confidence and enhance credibility of government policies. At the same time, policymakers need to consider options for minimizing the negative impact of fiscal consolidation on growth through an appropriate choice of fiscal policy instruments.

22. This paper finds that fiscal consolidation pursued through a combination of revenue increases and lower government consumption would have a more modest impact on growth than reductions in government investment in the short term. In particular, policymakers in Uruguay need to weigh the effects of reducing public investment (cut by close to 1 percent of GDP since 2015) on growth and consider a reorientation of budget spending from government consumption to capital spending.

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PRODUCTIVITY, FOREIGN DEMAND AND FACTOR ALLOCATION IN URUGUAY[1]

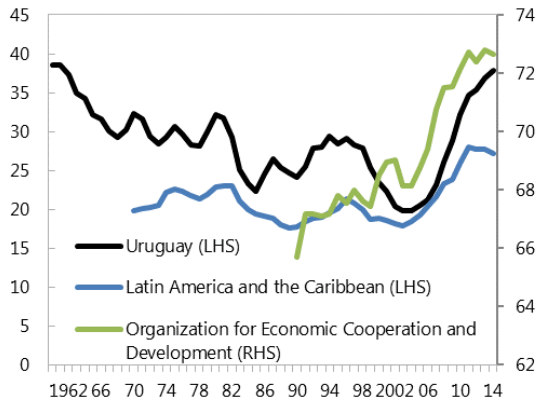
Long-run economic growth in Uruguay has relied in equal parts on productivity and factor accumulation. As an open economy with imported intermediate inputs, external demand is found to explain some of this productivity growth through the terms-of-trade. This work provides a newly-compiled dataset on GDP, employment and labor productivity by sector of production. These new data suggest that labor may not be efficiently allocated across sectors of production relative to other Latin American countries. More worryingly, Uruguayan workers tend to move from high- to low-productivity sectors.

A. Introduction

1. After four decades of decline, relative living standards of the average Uruguayan are only now catching up to where they were in the 1960s. In this sense, Uruguayan living standards have not improved relative to those of the United States over the last five decades. Living standards are measured here as Gross Domestic Product (GDP) per person (Figure 1). These relative living standards in fact declined, from 38 percent of U.S. levels to 20 percent the end of the 2001–2 recession, and then recovered rapidly. Over this period, living standards in Uruguay remained above those of countries in Latin America and the Caribbean and below those of countries in the Organization for Economic Cooperation and Development. In the most recent years, growth rates in Uruguayan living standards have declined somewhat (Figure 2).

Figure 1. Per Capita GDP Relative to the U.S.

(percent)



Source: Penn World Tables version 9.0 and IMF Staff Calculations.
Notes: Chart shows ratios of purchasing power parity gross domestic products per person that are comparable at each point in time.

Figure 2. Growth in Uruguay GDP Per Capita

(percent per year)

Source: World Economic Outlook Database (April 2017).
Note: Growth rates shown are 10-year rolling averages of underlying annual data. The underlying value for year 2017 is an IMF staff estimate. Underlying GDP is measured in constant price national currency units.

[1] Prepared by Galen Sher (WHD). The sector-level data produced in this study are available from the author on request.

2. Low investment rates and weakness in education are likely holding back growth in Uruguay. Investment averaged only 17 percent of GDP between 1981 and 2016, which is second-lowest among large Latin American economies.[2] Comparative statistics are 23 percent for Chile and 22 percent for Colombia. Uruguay achieves a competitive rate of completion of primary school education, but underperforms other Latin American countries in completion of secondary and tertiary education. The average Uruguayan over 25 years of age has only 2.3 years of secondary schooling and 0.3 years of tertiary schooling, which are second-lowest and lowest respectively among large Latin American economies.[3] (The comparative statistics are 3.7 and 0.5 years for Chile, and 3.1 and 0.8 years for Colombia.) Uruguay's relatively low completion rates for secondary education are associated with relatively high dropout rates, rather than low enrollment rates (OECD, 2014).

3. Nevertheless, this paper shows that productivity is the main driver of fluctuations in Uruguayan living standards. Uruguay's swings in living standards are more than twice what can be explained by movements in the available stocks of factors of production alone. For example, the labor force and the physical capital stock together grew at about twice the rate of the Uruguayan economy during the 1980s. Then, in the decade since the 2001-2 economic crisis, these magnitudes reversed, so that the quantity of goods and services produced in Uruguay grew at twice the rate of growth of these combined factors of production. This excess volatility in Uruguayan production suggests that there are important trends in productivity in the economy.[4]

4. This work explores two potential explanations for these productivity developments: global demand for Uruguayan products and the efficiency of the allocation of workers across sectors of production. One potential hypothesis for the post-crisis experience is that increasing global demand for Uruguayan products has benefited the terms at which Uruguayan exports can be traded for imported intermediate inputs. The analysis supports this view somewhat, but finds that models of this feature can only explain about ½ of a percentage point of increased yearly growth since the crisis. A second hypothesis, which relates more to Uruguay's lack of long-run convergence in living standards, is that labor resources may not be efficiently allocated to sectors of production. This paper shows that labor productivities are almost twice as spread out across Uruguayan sectors as they are across sectors in the United States, suggesting such labor market inefficiencies. Similarly, the evidence suggests that workers in Uruguay may not re-allocate from low-productivity sectors to high-productivity sectors, as they do in the United States. Instead, labor resources mostly flow in the wrong direction, hurting overall productivity growth.

[2] According to the April 2017 vintage of the World Economic Outlook database published by the IMF.

[3] In the year 2010, according to data published in Barro and Lee (2013).

[4] This conclusion assumes that there are no omitted domestic factors of production and that there are no important domestic demand effects. However, it does allow for an additional factor of production, in the form of imported intermediates, and it does allow for demand effects from abroad, both of which are investigated in this work.

B. Sources of Growth

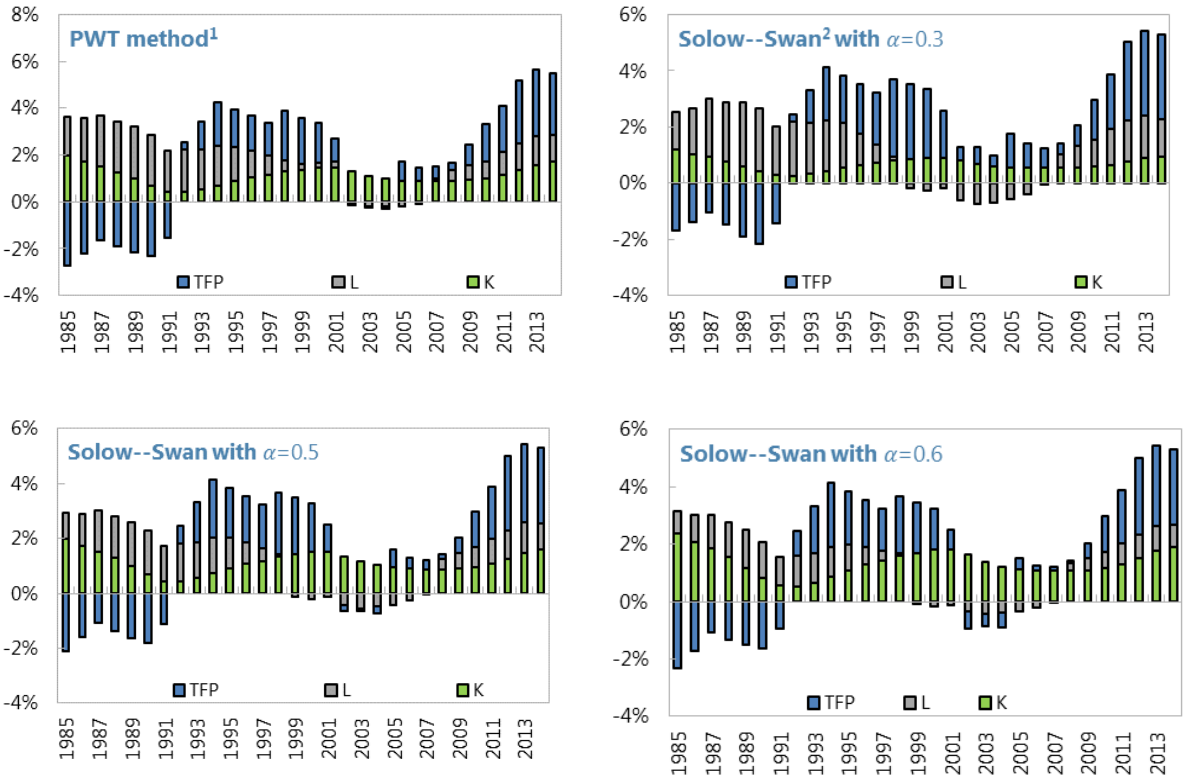
5. The value of all goods and services than an economy can produce reflects the stocks of available factors of production, especially capital and labor. Total factor productivity (TFP) is the efficiency with which factor inputs are converted into produced goods and services, and is typically measured as a residual that reflects the difference between the observed value of produced goods and services and the accumulation in factor inputs. This method is the neoclassical approach to measuring productivity (Solow, 1956; Swan, 1956). The TFP residual reflects many forces, including the terms at which exported goods can be traded for intermediate inputs and the efficiency of labor markets. In addition to TFP, the concept of average labor productivity is defined as the value of produced goods and services per unit of labor input.

6. Productivity has contributed slightly more than factor accumulation to Uruguay's long-run growth over the last four decades. Within the neoclassical paradigm, researchers disagree over the design of the shape of the production function and over the measurement of the stock of labor: the substitutability between capital and labor in production may be near-constant or may vary with the available stocks of these two factors; the share of output accruing to labor and its variation over time is uncertain;[5] and the stock of labor may be measured by the number of people employed or may additionally reflect the average number of years of schooling in the population and the returns to education. However, a variety of methods decompose Uruguay's growth similarly (Figure 3). Factor accumulation and decumulation seem to explain less than half of the variation in the growth of produced goods and services over this period, supporting the idea that productivity has been the primary driving force. The growth acceleration in recent decades also appears to come primarily from productivity improvements, although physical capital accumulation has picked up slightly. Periods of strong positive productivity growth in Uruguay contrast starkly with the experience in the rest of Latin America and the Caribbean, where productivity growth has been negative or almost zero in every decade since 1990 (IMF, 2017). Growth in the decades around Uruguay's crisis years appeared to suffer from higher unemployment and weak productivity, rather than any underinvestment in physical capital.

7. However, it may be important for an open economy like Uruguay to separate out the effects of foreign demand from this measured productivity. The above neoclassical approach ignores the possibility of imported intermediate inputs being used for production, which limits its applicability to a small, open economy like Uruguay. Uruguay imports crude oil and machinery as intermediate inputs into domestic production, and similarly exports intermediates in the form of agricultural products. Therefore, improvements in the terms at which Uruguay can exchange domestic goods for imported intermediate inputs (the "terms of trade") allow it to produce more domestically by importing more inputs from abroad. In turn, increases or decreases in foreign demand for Uruguayan products would improve or deteriorate respectively these terms of trade. It is possible to extend the neoclassical model by adding imported intermediate inputs as an

[5] The share of output accruing to labor fell from 52 percent in 1997 to 47 percent in 2005, according to the Penn World Tables version 9.0.

Figure 3. Contributions to Growth in a Neoclassical Model
(in percentage points of 10-year average annual growth)



Sources: Penn World Tables (PWT) version 9.0 and IMF staff calculations.
1/ PWT method refers to the method followed in the PWT version 9.0. TFP growth is as published in the PWT, and the split of the factor accumulation contribution between capital and labor follows equation (C4) in Feenstra et al. (2015).
2/ The parameter α in the Solow—Swan model refers to the elasticity of output with respect to the capital stock, which under ideal conditions implies a share of $1-\alpha$ of production accruing to the labor force.

additional factor of production, in the context of two countries[6] with one final good per country, where each country's final good also serves as an intermediate input in the other country (Acemoglu and Ventura, 2002). The extended production function and the optimal domestic demand for imported intermediate inputs give the equations

$$\begin{aligned} Y &= AK^{\alpha}L^{\beta}X^{\gamma} \\ X &= \gamma Y/p \end{aligned}$$

respectively, where Y is domestic production in units of the domestic country final good, A is a domestic residual productivity parameter, K is the domestic physical capital stock, L is the domestic labor stock, X is the quantity of imported intermediate inputs used in domestic production (measured in units of the foreign country final good), p is the price of the foreign country final good

[6] The two countries can be thought of as Uruguay and the rest of the world.

in units of the domestic country final good (i.e. the reciprocal of the domestic country's terms-of-trade), parameters α, β, γ are elasticities of domestic production with respect to each of the factor inputs. These two equations can be combined to obtain

$$Y = \left[\left(\frac{\gamma}{p}\right)^{\gamma} AK^{\alpha}L^{\beta}\right]^{\frac{1}{1-\gamma}}$$

which shows how the terms of trade $1/p$ enter the production function. Improvements in the terms of trade, arising for example from a surge in foreign demand for domestic goods,[7] allow a country to produce more with the same quantities of labor and physical capital. Such an improvement would be attributed to the productivity residual in the preceding neoclassical model. The parameter γ determines the importance of these effects associated with foreign demand and terms of trade, and can be expected to be larger for a country that is more open to international trade and more specialized in its production.

8. Foreign demand appears to account for about ½ of one percentage point Uruguay's long-run growth, which is small relative to the above measures of productivity. While estimates are available for the parameters α, β, they are difficult to obtain for the parameter γ. Under ideal conditions,[8] the parameter γ should equal the share of production accruing to the owners of imported intermediate inputs. Johnson and Noguera (2012) find that Uruguay's value-added in exports is 71 percent of its gross exports, suggesting that imported intermediates constitute the remaining 29 percent of gross exports. If Uruguay's domestic production of all goods and services is comparable to its production of exports, then 0.29 would be an indicative value of γ under the above ideal conditions.[9] However, it remains to reconcile such an estimate with those in the literature on the shares of production accruing to the owners of labor and physical capital. Figure 4 shows decompositions of long-run growth under a range of assumptions on the parameter γ. Historically, changes in Uruguay's terms-of-trade correlate positively with changes in the naïve TFP residual from the neoclassical model above, so it is no surprise that terms-of-trade movements do absorb some of the contribution of movements in residual TFP. Values of γ of at least 0.3 seem necessary for terms-of-trade mechanisms to make a material contribution to explaining growth, but values larger than 0.4 seem to reverse the sign of the TFP residual in the 1990s and after 2007.[10,11]

[7] A similar production function can be written down for the rest of the world economy, and terms of trade can be endogenized by defining it as the relative price that clears the market for international trade. These extensions would not change the dependence of domestic production on domestic terms of trade.

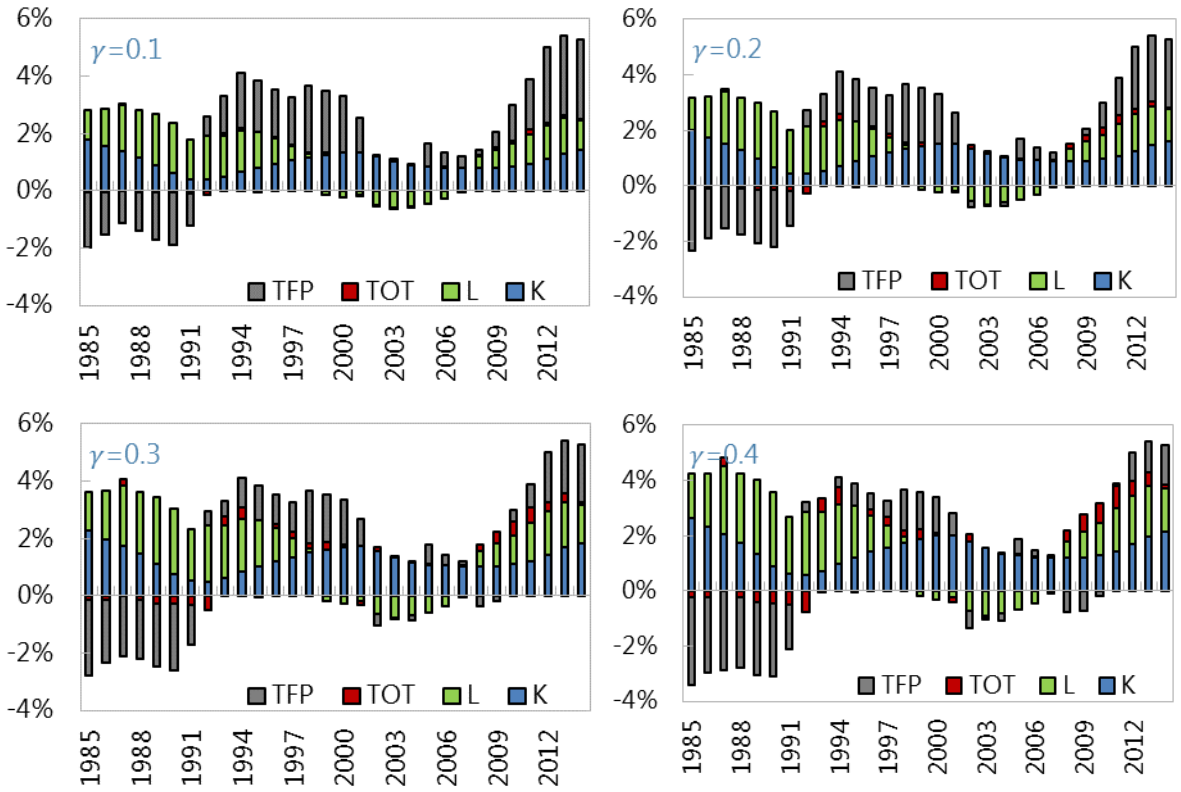
[8] Specifically, perfect competition in the market for imported intermediate inputs and a production function exhibiting constant returns to scale, $\alpha + \beta + \gamma = 1$.

[9] Uruguay ranks as more sensitive to foreign factors than Chile (with a share of 0.2 accruing to intermediate inputs), Colombia (0.14) and the United States (0.23), but less sensitive than Mexico (0.33) (Johnson and Noguera, 2012).

[10] As the parameter γ increases, the size of the contribution of growth in the terms-of-trade factor increases. At large values of γ, the combined contribution of accumulation of factors of production and growth in the terms-of-trade can exceed the growth in real GDP, leading to a negative productivity residual.

[11] As a caveat, it should be mentioned that the success of terms-of-trade in explaining TFP in Uruguay does not extend to decades prior to the one ending in 1985.

Figure 4. Contributions to Growth in an Open-economy Extension of the Neoclassical Model
(in percentage points of 10-year average annual growth)



Sources: Penn World Tables version (PWT) 9.0 and IMF staff calculations.
The parameters α, β and γ control the shape of the production function, specifically the elasticities of physical output with respect to domestic capital, domestic labor and intermediate inputs, respectively. The parameters α, β are set at levels 0.4 and 0.5 respectively.

C. Allocation of Labor Resources

9. The efficiency of the allocation of scarce resources across sectors of production affects the productivity of an economy. Ideally, sectors of an economy should compete for workers through the wage rate. Sectors with higher marginal productivities of labor should expand production by offering higher wages and attracting more workers, while other sectors should shrink, until the sizes of all sector settle at levels that equate the marginal labor productivities across sectors. Distortions to the labor market could disrupt this ideal mechanism. For example, segmentation of the labor market (perhaps through skills specificity) or immobility of workers between regions could limit the optimal allocation of labor resources. Similarly, government subsidies to production in a particular sector could lead that sector to grow beyond its efficient size and prevent workers from leaving that sector. As another example, barriers to entry of new firms in a particular sector could lead the incumbent firms in that sector to experience higher labor productivity than firms in other sectors that pay the same wage, and the absence of any wage

premium in that sector would prevent workers from reallocating into that sector, where their marginal productivity is higher.

10. Existing evidence suggests that Uruguay's economic performance may be held back by inefficient functioning of labor markets. A recent worldwide survey of executives ranked Uruguay 121st out of 137 countries in on labor market efficiency (Schwab, 2017). Within this category, respondents identified cooperation in labor-employer relations (rank 131), flexibility of wage determination (rank 135), hiring and firing practices (rank 126) and the effect of taxation on incentives to work (rank 132) as the most problematic issues. Kaldewei and Weller (2013) find that only 0.7 percent out of Uruguay's 4.4 percent yearly growth in output per worker between 2006 and 2011 could be attributed to the reallocation of labor from low to high productivity sectors, with the large remainder coming from productivity improvements within sectors. Cassoni, Allen and Labadie (2004) find that from 1975 to 1997 the wage bargaining processes in Uruguay inhibited the wage flexibility that would encourage workers to move between sectors. Wage bargaining in Uruguay occurs in each sector between firms and trade unions, with participation of the government. The sector-by-sector bargaining process artificially segments the labor market, which produces wage differentials between sectors for similar workers and thus prevents a dynamic reallocation of labor across sectors. A historical lack of representation in the negotiations of some firms and the unemployed means that agreed wages for any sector may not reflect the preferences of all such parties, resulting in an excess supply of workers at agreed wages.

11. To analyze the allocation of labor resources across sectors of production, this study compiles new data on GDP, numbers of workers and production prices across sectors in Uruguay. The data are compiled by combining information on sectoral GDP in current and constant prices, employment rates by region, sectoral distributions of employees by region, and regional population sizes. The source for these data is the Instituto Nacional de Estadística (INE). Assumptions are required to match the three different vintages of sectoral classifications. A full description of the data compilation appears in Annex I.

12. Over the last two decades, these data show that the composite sector of transport, storage and communication has experienced the highest average labor productivity (20 thousand dollars per worker, in 2005 prices) and the fastest average growth in labor productivity (9.3 percent per year). Table 1 presents summary statistics of these data, according to the six-sector classification explained in Annex I. Employment is concentrated in the public sector, which makes up four-fifths of the workers shown in the "Financial and Community" sector. The construction sector has experienced the highest average labor productivity when measured in 2015 prices, because there has been large output price inflation in this sector.

Table 1. Growth, Employment and Labor Productivity by Sector in Uruguay

	Agriculture, Mining	Manufactures, Utilities	Construction	Trade, Hospitality	Transport, Storage, Communication	Financial, Community
Geometric mean annual growth in number of workers, 1991-2016						
	-0.3%	-1.6%	0.8%	1.2%	2.7%	0.7%
Geometric mean annual growth in real GDP per worker, 1991-2015, in constant 2015 prices						
	2.9%	2.9%	1.1%	3.6%	9.3%	2.1%
Mean number of workers, 1991-2016						
	92,000	291,091	147,847	399,425	113,050	825,100
Mean real GDP per worker, 1991-2015, thousands						
Pesos[1]	413	446	127	152	485	201
USD[2]	17	19	5	6	20	8
Mean nominal GDP per worker, 1991-2015, thousands						
Pesos	431	300	219	153	292	227
USD[3]	23	16	11	9	16	12

Sources: INE and IMF Staff Calculations. The six sectors are defined in terms of the standard ISIC classification in Annex I.
1/ Constant 2005 national prices.
2/ Constant 2005 national prices and 2005 market exchange rates.
3/ End-of-year market exchange rates.

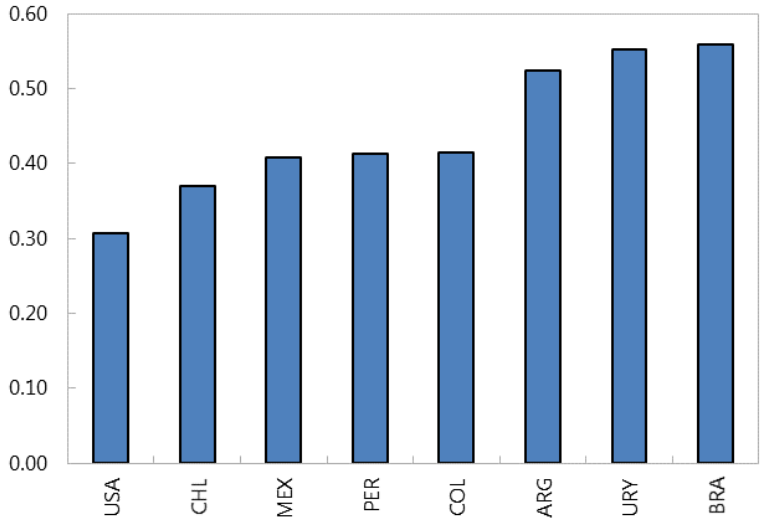
13. The United States achieves a spread in labor productivities across sectors that is 43 percent lower than that of Uruguay, suggesting that substantial productivity gains are possible by eliminating distortions to the efficient allocation of labor across sectors of production. As explained above, labor should reallocate across sectors to equate these sectors' marginal productivities of labor, in the absence of distortions. Larger differences of marginal labor productivities between sectors are therefore an indication of greater labor market distortions that could be a potential source of productivity improvements.[12] The newly-compiled data above provide an opportunity to produce new measures of the spread of average labor productivities across sectors. Sectoral labor productivity data are available for other countries from the Groningen Growth and Development Center (GGDC) with a comparable sectoral classification to that available for Uruguay. A measure of the spread across sectors in average labor productivity[13] places Uruguay between its two large neighbors, Brazil and Argentina, with which it shares historic and economic linkages (Figure 5). Other Latin American countries like Chile, Mexico, Peru and Colombia achieve a lower spread of average labor productivities across sectors.

[12] Hsieh and Klenow (2009) apply this idea to measure the allocation efficiency of labor and physical capital across manufacturing firms in China and India.

[13] Average labor productivities (i.e. GDP per worker) can be measured for each sector without additional assumptions on the shape of the production function. However, if an isoelastic (e.g. Cobb—Douglas) production function is assumed for every sector, with the same shape for each sector, then marginal and average productivities differ only by a constant of proportionality. In this setting, the labor allocation that would equate marginal labor productivities across sectors would be the same as the labor allocation that would equate average labor productivities across sectors.

Figure 5. Spread in Labor Productivities Across Sectors

(average coefficient of variation)

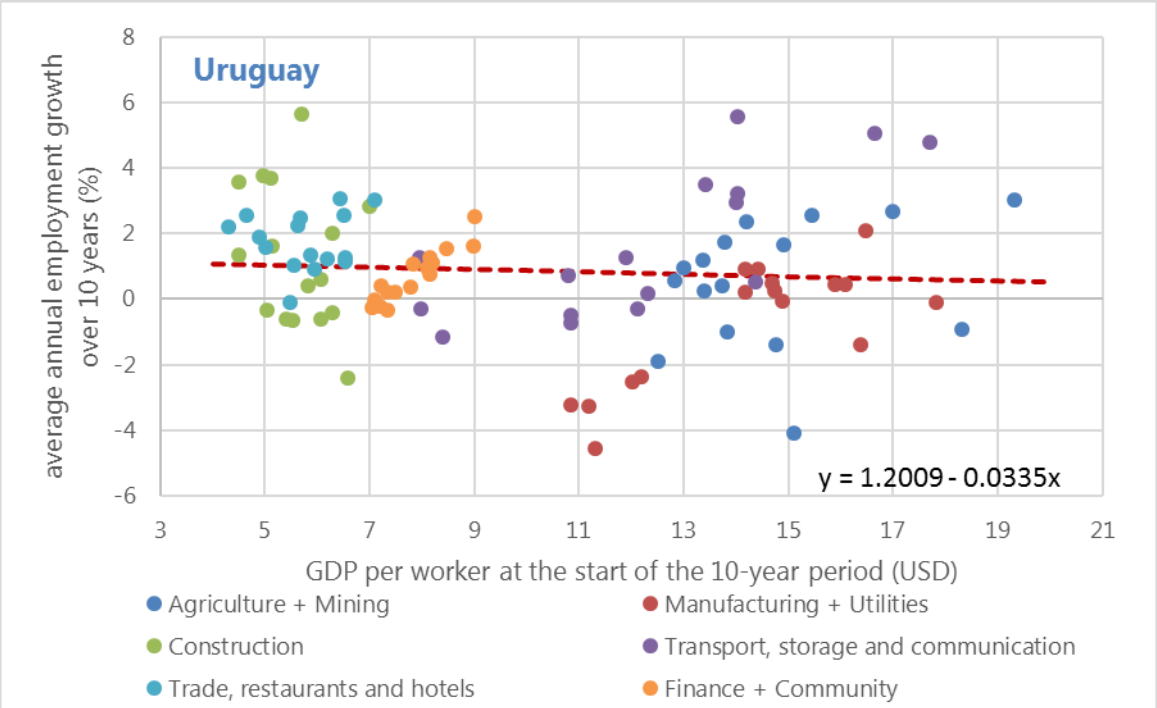


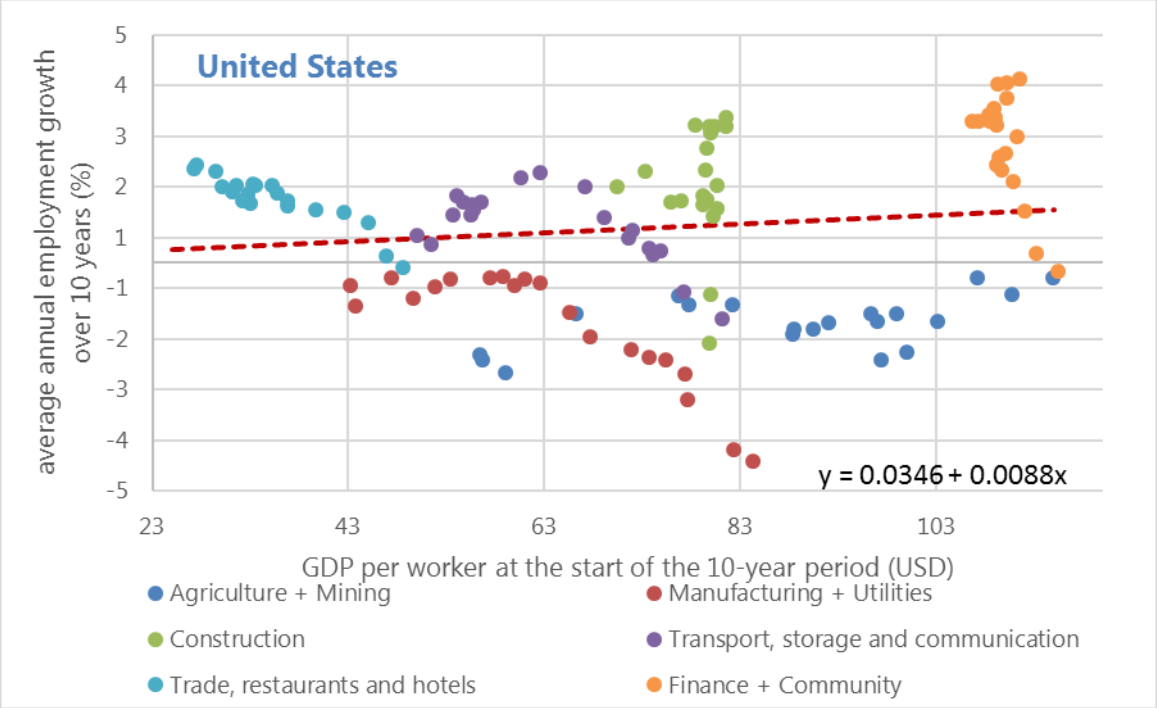
Sources: Groningen Growth and Development Center (GGDC) 10-Sector Database, INE and IMF Staff calculations.
Note: the chart shows the average over time of the coefficient of variation across sectors of the level of labor productivity. In turn, labor productivity is measured as GDP per worker in 2005 U.S. dollars, using constant national prices and market exchange rates.

14. In Uruguay, workers tend to move out of sectors with high labor productivity and into sectors with low labor productivity. Uruguay's labor reallocation process produces a *negative* relationship between sectoral labor productivity and sectoral employment growth in the subsequent ten years (Figure 6).[14] By contrast, in the United States, sectors with high labor productivity tend to attract more workers over the subsequent decade, while sectors with low labor productivity tend to lose workers. This phenomenon in Uruguay is particularly driven by the trade, restaurant and hotel sector, which attracts many workers despite low levels of labor productivity, and the composite sector of manufacturing and utilities, which experience declines in employment (or only modest increases in employment) despite relatively high levels of labor productivity.

[14] A similar analysis is conducted for Argentina, Brazil, and groups of countries like Latin America, in McMillan and Rodrik (2011).

Figure 6. Labor Reallocation Between Sectors According to Productivity





Sources: GGDC 10-Sector Database, INE and IMF Staff calculations.
Note: GDP per worker is measured in 2005 U.S. dollars, using constant national prices and market exchange rates. Each point on the chart shows a sector—decade pair. The dashed line shows a least-squares fit and its associated equation is displayed.

D. Conclusion and Policy Discussion

15. Lifting policy-related obstacles to investment in physical and human capital could bring factor accumulation closer to other countries in the region. Productivity is important to Uruguay's growth relative to factor accumulation, and compared with other countries in Latin America and the Caribbean. This suggests either that the Uruguayan economy is relatively good at innovating, or that there are limitations to the accumulation of factors of production in Uruguay. Persistent weakness in public investment, and a lack of availability of credit for firms with revenues denominated in pesos, are two potential policy-related limitations to investment. Similarly, weakness in the attainment rates for post-primary education and in the quality of education (as measured by domestic performance on internationally standardized tests) suggests that policies could alleviate constraints on the accumulation of human capital. Female labor force participation rates remain below rates for males, and policies to extend public childcare facilities or to extend paternity leave could help expand the labor force, especially with an aging population.

16. Enhancing the flexibility of the exchange rate regime could improve the ability of the exchange rate to absorb terms-of-trade shocks. Some of Uruguay's productivity performance over the last four decades is due to changes in terms-of-trade that could reflect global factors, like the increase in demand from China for Uruguayan exports. Uruguay maintains a flexible exchange rate, which acts as an absorber of exogenous terms-of-trade shocks. However, official interventions in the foreign exchange market are common, influenced by a desire to smooth short-term volatility in the exchange rate that could have costly effects on wealth and consumption in this dollarized economy. An assessment of the optimal degree of smoothing seem warranted, to ensure that the benefits of the exchange rate as a shock absorber are maintained as much as possible.

17. Policies to eliminate distortions and foster labor mobility can improve the allocation of labor resources across sectors. A lack of wage flexibility prevents the price mechanism from re-allocating workers from low-productivity sectors to high-productivity sectors. Ensuring the availability of training programs and insurance mechanisms could assist in the mobility of labor between sectors of production. Passing through more of input price changes into administered prices across various sectors could remove time-varying distortions to their optimal size, and could thus increase labor mobility between these sectors.

18. Trade integration and labor productivity interact in a complicated manner in Latin America. McMillan and Rodrik (2011) explain that over the last half century, Latin America ambitiously reduced barriers to trade, exposing unproductive tradable sectors of production to competition from imports, while employing somewhat tight monetary policy to reduce inflation. Productivity improvements in manufacturing sectors came from their rationalization, but given capacity constraints to highly productive commodity-exporting firms, displaced workers moved into unproductive industries. In Uruguay, labor moved from manufacturing into hospitality.[15] Along with these structural changes, trade integration brought significant productivity benefits to Uruguay's export sectors, which are small and specialized relative to those of trading partners.

[15] It is not obvious whether rationalization of employment in manufacturing sectors came primarily from technology gains and the falling price of capital or import competition.

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Annex I. Construction of Sectoral Data

This annex describes the sources, procedure and assumptions used to compile data on sectoral value-added in real and nominal terms, and sectoral employment.

Instituto Nacional de Estadistica (INE) provides data on:

- The value added of each sector, in current and constant national price pesos. These data are provided yearly between 1983 and 2015. Between 1983 and 2006, the constant-price value-added data are provided in constant 1983 prices, and since 2007 they are provided in constant 2005 prices.
- The aggregate rates of employment for each of the interior and Montevideo. These data are available monthly between 1991 and May 2017.
- The distribution across sectors of the employed populations of the 'urban' interior[1] and Montevideo. For the urban interior, these data are provided in non-overlapping quarters until 2000, overlapping quarters between 2000 and 2011, and monthly thereafter.[2]

The key complication with combining these data is that the classification of sectors of production differs between the value-added and employment data, and between the current and constant-price value-added data. The available sectoral classifications also vary over time. Until 2006, the sectoral classification of the value-added data follows the second revision of the International Standard Industrial Classification of All Economic Activities (ISIC) of the United Nations, and the third revision thereafter.[3] The sectoral distribution of employed workers follows the ISIC revision two, three and four, in periods 1991—2000, 2000—2011, and 2011—2017 respectively. Some of the sectors are combined and presented as aggregates relative to the more detailed classification of the ISIC. This aggregation procedure differs between the constant-price value-added data, the current-price value-added data and the sectoral employment data, and between the different time periods.

At most six categories can be used to match the data on value added and employment. These categories are presented in Table 1. By aggregating data at more detailed sectoral levels up to this six-sector level, estimates are obtained at each year-end for value added in current prices by sector and for the distribution of employed workers across sectors.

[1] The 'urban' interior consists of localities with more than five thousand inhabitants.

[2] For the period 2000—2011, in which distributions of employed workers are provided in overlapping quarters, data for the last quarter of each year are used here as the relevant data for the end of that year.

[3] Revisions two, three and four of the ISIC classify sectors of production into ten, seventeen and twenty-one categories respectively.

Table 1. Six-Sector Classification of Sectors of Production

Short label	Description	ISIC codes
Agriculture, Mining	Agriculture, forestry, hunting, fishing, quarrying and mining	1-2 (revision 2) A-C (revision 3) A-B (revision 4)
Manufactures, Utilities	Manufacturing industries, electricity, gas and water	3-4 (revision 2) D-E (revision 3) C-E (revision 4)
Construction	Construction	5 (revision 2) F (revision 3) F (revision 4)
Trade, Hospitality	Trade, restaurants and hotels	6 (revision 2) G-H (revision 3) G, I (revision 4)
Transport, Storage, Communication	Transport, storage and communication	7 (revision 2) I (revision 3) H, J (revision 4)
Financial, Community	Services including financing, insurance, real estate, business, community, social and personal	8-9 (revision 2) J-Q (revision 3) K-U (revision 4)

In a given year, the number of workers in each of the six sectors is estimated by combining population estimates, employment rates and the proportion of employed workers in that sector. Populations of 1.4 and 2 million people are assumed for Montevideo and the interior respectively.[4]

[4] In future work, these estimates should be extended to allow for population growth over time.